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The ELECTRICAL REVIEW

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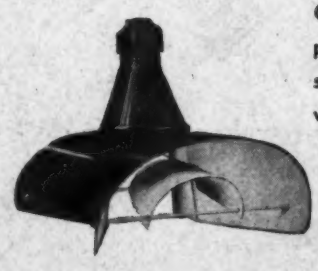

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The
Electrical Review

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Questions of the Hour

OUT of six hundred electricity supply undertakings in Britain only sixty supported the cooking campaign of last summer! Instead of the specially prepared literature finding its way into 4,000,000 homes it entered only 400,000!

This deplorable fact was cited at the Birmingham dinner last week by Mr. C. H. Cox, chairman of E.D.A. Council, in his speech emphasising the urgent need for an efficient central body to be set up for guiding and energising the selling side of the electricity supply industry. The whole industry is not pulling together at a time described by Sir Andrew Duncan as a new era of electrical development presenting an exceptionally favourable opportunity.

As has been stressed in these pages scores of times during the last few years it is to the domestic consumer that the whole electrical industry has to look for some time to come as the principal source of its revenue, and Mr. Cox confidently asserted that if everybody electrical lent his aid to the progress movement nothing could prevent the present consumption of 230 kWh per head of population being trebled or quadrupled in a short time. What is it that prevents the industry from so organising itself that this may be achieved?

Eighteen months ago we urged the electricity supply industry to proceed with a canvass of non-consumers and small consumers everywhere. A national effort was what we appealed for. We received some support, but to-day the call for a national effort is insistent from many quarters. Will those who carry responsibility for decision in such a matter continue to turn a deaf ear?

In an important speech, delivered also at Birmingham, Mr. C. D. Taite referred to the willingness of the Central Electricity Board to co-operate with the industry in carrying out the great work that lies before it. The Board and the grid must be regarded as the centre of the industry. Dealing with the question of distribution development, he intimated possible measures of rationalisation and quite naturally touched upon the outstanding subject of publicity. He revealed the fact that this matter is being considered by the National Consultative Committee which will shortly make known its conclusions, together with recommendations.

In this connection the need for greatly increasing the financial resources of E.D.A. of course arises. Some way will have to be found for furnishing it with sufficient means for conducting not only what we have come to regard as its normal operations but others besides, including almost unquestionably sales development work. It was obvious from Mr. Taite's remarks that many ideas of consequence regarding distribution are occupying the minds of those in authority over us. Tariffs, the merging of smaller systems selling less than 5,000,000 kWh per annum into larger undertakings, and the collection of detailed data respecting distribution costs are among the most important of these.

The National Convention

ONE point upon which it seemed to us possible for immediate action to be taken as part of a general progressive electrical movement was the holding of a national convention to mark the grid stage of 1933. Apathy, disinterestedness, cold water, characterised the attitude of some who might have made it an accomplished fact had they so chosen. Somebody here, somebody there, was responsible for nothing being done. Mr. Jennings pleaded once again at Birmingham for the holding of this "get-together" convention of the whole industry. Mr. Purse urged it in his vigorous speech to the wholesalers last month when he appealed for greater co-operation within the industry. It amuses us to read the comment published in the official organ of one of the associations, as the outcome of Mr. Purse's remarks, that the E.C.A. Council is not opposed to a national conference. It

was in the same quarter that the organisation of such an event was described as "the very devil," as we indicated in our leader of November 11th last under that striking title. It is something to learn at this late date that the E.C.A. Council regards the proposition as "worthy of the most careful investigation." Assuredly we are getting on! For 1933, we learn, it was impossible—arrangements had already been made—and so on, but we are happy to be informed that the agreement of "suitable joint arrangements for 1934 represents quite another story," whatever that may mean. In heaven's name, if we mean to hold a convention in 1934, let us have done with dilly-dally and get on with the job at once!

Hot-cathode Street Lamps.

THE prime condition for good illumination of roads used by fast motor traffic is well fulfilled at Watford Road, Wembley; that is, the rendering of objects clearly visible well ahead of the vehicle. The improvement over the neighbouring stretches of road lighted by gasfilled lamps is most marked, and there is also a notable freedom from glare. The colour values appear to us to be better than those afforded by the experimental installation at East Lane, and certainly better than those of the old mercury-vapour lamp. An important feature of the "Osira" lamp is that it can be run off the ordinary street-lighting mains with the minor additions of a small reactance and condenser in the base of each standard. The development is likely to do much to stimulate the movement towards adequate street-lighting, as a reduction of nearly 60 per cent. in the energy consumption should appeal to public authorities, but we see no inherent reason against a still further saving, even with a more continuous spectrum.

Electrified Railway Success.

WHILE a straight case for railway electrification has been made out under existing conditions, it has been shown that more favourable comparisons could be drawn if credit were taken for the incidental advantages that experience suggests may reasonably be expected to follow conversion. One of the most important is increased traffic. Mr. Gerald E. Loder, chairman of the Southern Railway Co., states that in the first 5½ months of electrified working on the Coulsdon to Reigate and Three Bridges line, which was started up last July, traffic receipts increased by 13½ per cent. The electrification of the remaining portion of the line was not completed until the end of last year, but in January the increase was 5 per cent., due to the conveyance of 73,000 more passengers—this, notwithstanding the usual seasonal slackness of traffic. Mr. Loder considers that the increase in traffic already realised justifies the electrification of the main line to Brighton and Worthing. We hope the chairmen of other railway companies will be convinced by this statement of actual operating results.

Sabotage?

WHAT is the object of certain attacks on the grid that have been appearing recently in some of the lay papers? We do not refer to criticisms of detail, which may be helpful, particularly if brought to the attention of the Regional Consultative Committees, but to insinuations of the "white elephant" type. The chairman of the Brighton Gas Co. referred to the cost of the grid as £354 million, following a statement reported to have been made by Mr. G. E. Hider to the South Wales Branch of the Institution of Mechanical Engineers. The actual figure, including frequency standardisation, is of course only about one-seventh of that amount. Statements of this kind may be due merely to ignorance, but some articles, generally criticising the fundamental principles of interconnection, obviously derive their inspiration from electrical sources. Such destructive criticism is nearly seven years out of date, and can only be harmful to electrical development. The ELECTRICAL REVIEW was consistently critical until the scheme was passed by the legislature. We then appealed to all interested to join with us in efforts to secure its success. That is still our attitude.

State-aided Research

THAT the State can aid industry by financing research into problems that may bring no immediate commercial gain is common ground for most shades of political opinion. We regret that the Department of Scientific and Industrial Research has found it necessary, in view of financial stringency, to reduce the number of grants made for those investigations that are less obviously useful to industry. While we share Lord Rutherford's hope that national circumstances may soon allow the position to be remedied, we uphold the views recently expressed by Sir Hugo Hirst that manufacturing economies should not involve the cutting down of research facilities. We cannot afford not to spend the money if we are to be ready to take our place in the forefront of industrial nations in the future.

The Severn Barrage

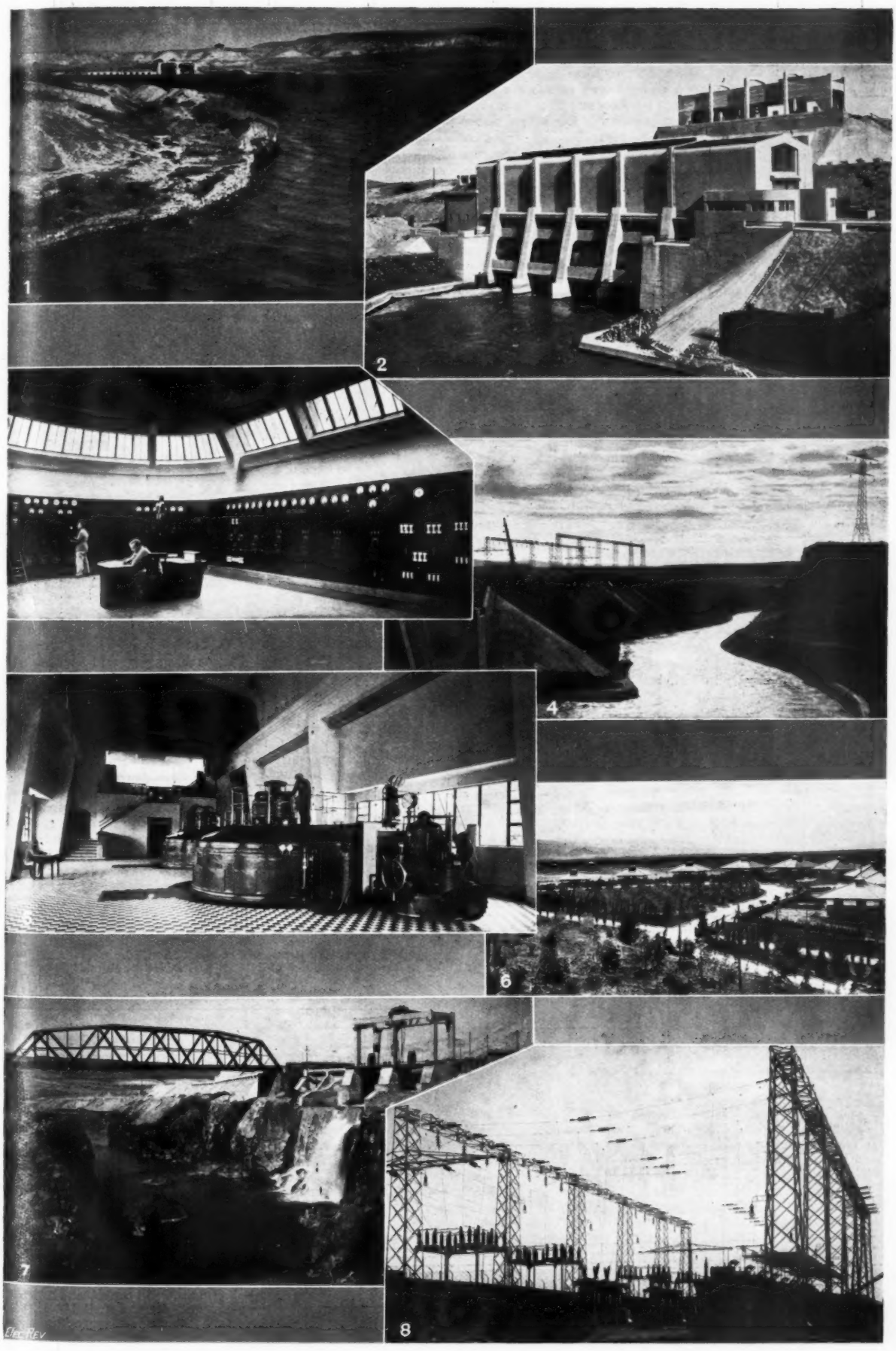
THE long-awaited final report of the Severn Barrage Committee of the Economic Advisory Council was issued this week (Stationery Office, 6d.). An appendix containing plans, etc., has been published separately. The total cost of the scheme is estimated at about £50.5 million, of which the power scheme will require some £38.5 million. The commercial value of the water power will, of course, depend upon whether the cost of producing 1,610 million kWh per annum is less than that which would be incurred in the most modern coal-fired stations. Tidal fluctuations would prevent the reaping of any economic advantage without the provision of a secondary storage system, the cost of which (£11.5 million) is included in the total given above. The Committee finds that, allowing for improvements in generation, the saving due to the barrage scheme would amount to about one-third of the overall costs of production.

The Carrot and the Donkey

THE fixed charge made by the Brighton Corporation Electricity Department as the primary part of its tariff for consumers on its housing estates has come under the criticism of the chairman of the local gas company. "The carrot dangled in front of the donkey" is, he says, that after paying 2s. 6d. per week, the consumer can obtain electricity at ½d. per unit. It is surely a mistake to assume that the public is always an ass, especially as gas undertakings are seeking powers to adopt the two-part tariff in the sincerest form of flattery of the electrical industry. Carrots are also good food for human beings, and many thousands more would use electricity for all purposes if they were tempted by a ½d. rate (and ⅓d. for water heating, as Mr. W. N. C. Clinch offers). Brighton is going ahead with electricity, though not with gas, the sales of which showed a slight decrease last year.

E.H.P. Turbines

THERE is now about a score of plants in the world operating with steam pressures above 1,000 lb. per sq. in. Of these only two are in Great Britain, where the opinion seems to prevail that there is a broad band between 650 and 1,100 lb. per sq. in. in which the thermal gains are counterbalanced by increased capital cost and complications in operation. Although conditions here have not hitherto encouraged the use of pressures in excess of 650 lb., British manufacturers are well able to meet all requirements in this direction. Thus, the 24,000-kW Met-Vick turbine for Moscow, designed for nearly 1,800 lb., will be, it is said, the largest in the world for a pressure exceeding 1,000 lb. per sq. in. High temperatures present even more difficult problems, but as a result of researches into creep in the company's laboratories the turbine has been designed to work continuously at 930 deg. F.



The Undertaking of the Palestine Electric Corporation. **(See page 342)**

1. The basin where the waters of the Jordan and Yarmuk Rivers are dammed. 2. The power house. 3. The control room at the Rutenberg works. 4. A view of the transformer equipment and a transmission tower. 5. The generators. 6. Houses erected for the Corporation's officials and staff. 7. The Jordan weir. 8. A "close-up" of the transformer station

D

The Technical Library. By F. C. Duffield

How a good system of classification saves time

EVERY business man or engineer requires some out-of-the way piece of information at least once or twice a week. If the staff is large different people waste time by making the same search for the same information. For a firm manufacturing radio parts information regarding all types of synthetic insulation materials should be available. The firm would probably look up a trades directory and send inquiries to three or four companies picked more or less at random. Or a member of the staff may remember seeing an article somewhere on a new type of insulation, and a search of all the old periodicals will be made only to find that the parti ular copy required has been destroyed.

In a business library there is no necessity to go into such details as in public libraries. A good filing clerk can be satisfactorily trained, provided the library is started on the right lines, and the knowledge gained in indexing and cataloguing would be shown in the improvements he would bring about in the normal filing.

A firm cannot afford to spend much on new books, but generally the information contained in them has previously appeared in the technical Press or in some society's transactions; if the information is not classified the firm may purchase books on subjects which have already been covered by technical articles. The following points must first be settled: (*a*) The information to be kept; (*b*) the methods of accession; (*c*) records; (d) system of classification and indexing.

Information Worth Keeping

When deciding what information is to be kept, the whole business of the firm should be reviewed and the opinion of every person affected invited; it should also be decided which periodicals will be purchased. Generally, it is better to start with as little as possible and leave it to the librarian to suggest additions from time to time. He will soon learn the lines on which the library should be developed and will avoid the collection of useless information. All periodicals, catalogues, trade lists, pamphlets, brochures, &c., should go to the librarian before going to the staff; he will then be able to trace any one of these and make sure that it is returned to him for filing. Anything which it is desired to keep should be entered in an accession book. A suggested ruling for this book is in fig. 1.

Ample space should be left for ruling additional columns. If an issue system is being used, it is only necessary to enter the accession (or progressive) number, the name of the borrower, and the date. The issue book should be separate from the accession book, although if plenty of space is allowed the latter can also serve as stock and withdrawal book. The issue book may be ruled as in fig. 2.

Mr. F. C. Duffield is a member of the staff of the Birmingham Electric Supply Department and hon. librarian of the South Midland Centre of the I.E.E.

Progressive Number.	Author and Title or Description.	Location.	Place and Date of Publication.	No. of Vols.	Binding.	Catalogued.	Classification No.	Remarks.

Fig. 1

The chief classification systems are:—Name, adjustable, decimal, expansive, and subject. These have all been extensively adopted and each exists as a separate printed work with an index, which is a vital part of any method of classification. The best course is to adopt a complete printed and accessible scheme with as little modification as possible. As the library will be of a specialised character, it will also be necessary to classify more minutely than any printed scheme, but modifications should not be made until all the possibilities of the published scheme have been exhausted.

System of Classification

In the adjustable classification system the letters of the alphabet are arranged to represent different classes, *e.g.*, A= Science; B=Useful Arts; C=Fine and Recreative Arts, &c. Each of these classes is sub-divided into various subjects. For instance, B.94-102=Electrical Engineering. This system has the big disadvantage that it is not capable of expansion, and one is almost forced to use it as it was originally issued in 1898.

Decimal classification is by far the most popular. It was originally introduced by Melvil Dewey last century, but numerous additions have subsequently been made. The entire work, complete with relative index, can be obtained for about 35s. Although this system is by no means perfect, it is the one used in all modern large libraries, and many of the older libraries have also adopted it.

The name of the system signifies its construction, the whole subject matter of the universe being divided into ten classes numbered 0 to 9. Each of these ten classes is divided again. Thus each of the subjects in Class 6, Useful Arts, is numbered in tens from 600, *e.g.*, engineering is numbered 620, and is split up into groups numbered by ones from 620. Mechanical engineering, 621, is classified into groups progressing serially by 0.1. Electrical engineering, 621.3, is classified as follows:

621.30 General electrical work,
621.31 Dynamo-electric generation,
621.32 Lighting,
621.33 Traction,
621.34 Other power uses,
621.35 Voltaic and chemical generation,
621.36 Thermo-electrics,
621.37 Electro-chemical applications,
621.38 Electric communication,
621.39 Other industrial applications.

This sub-division may be carried on indefinitely, so that it is possible to expand a particular subject to any limit.

As an example of the further extensions which can be made to the Dewey system of decimal classification, I would refer readers to Circular No. 138—Decimal Classification of Radio Subjects, published by the Bureau of Standards, Washington. This extension deals exclusively with radio subjects, and instead of prefixing the figures 621.384 (the Dewey number) against each division, the number has been replaced by the letter R. These extensions are very useful for specialised libraries, but no similar extensions should be made until the system as published has been thoroughly exhausted.

Cataloguing

If the library is of the "open access" type, some form of catalogue will be necessary. The dictionary type of catalogue is the most easily understood, but its preparation is costly and laborious. A simpler method is to purchase a dictionary of technical terms on the subjects in question and mark the classification numbers opposite each dictionary entry. It may then be necessary to keep a card index of the books, articles, &c., arranged in order of classification numbers. These cards should be made out as shown below:—

16 621.31324.
AVERY, A. H.
"Fractional Horse-Power Motors" deals with the essential details of construction, design, testing and performance of 1/100th to 1/2-H.P. motors.
1 sm. 8vo. 159 pp. London, 1931.

The cards may be dispensed with if the books are arranged

Progressive Number.	Date Issued.	Date Returned.	Name and Address of Borrower.

Fig. 2

on the shelves in accordance with the numbers under which they are classified.

The Institute of Metals

The 25th annual general meeting of the Institute of Metals will be held on March 8th and 9th at the Institution of Mechanical Engineers under the chairmanship of the president, Sir Henry Fowler. Among the papers of electrical interest to be presented on March 8th for discussion are: "The Electrical Conductivity of Aluminium Wire" (A. S. Field and J. H. Dickin), "Graphitic Silicon Heat-Treatment and the Electrical Conductivity of Aluminium" (L. H. Callendar), "An X-ray Investigation of the Copper-Aluminium Alloys" (A. J. Bradley and Phyllis Jones). The programme for March 9th includes a paper on "The Equilibrium of the Reaction between Steam and Molten Copper" (N. P. Allen and T. Hewitt). Synopses of the papers can be obtained from Mr. G. Shaw Scott (secretary), 36, Victoria Street, London, S.W.1.

Discharging Grain. By Robert N. Tweedy

A modern automatic electrical system

AFTER seeing the completely automatic grain discharging plant, just put into commission at the Port of Dublin by the Merchants' Warehousing Co., Ltd., of that city, it requires considerable mental effort to believe that on the other side of the river there still persists what may be called the "coolie" system of discharge, by which the grain is man-handled from the hold to the warehouse. The perfect system of discharging which is the subject of this article must deprive a large number of men of employment, but the situation has been met in Dublin with an all-too-rare display of humanity and courage by the Warehousing Co., which has agreed to distribute *ex gratia*, no less than £5,000 to more than 150 men as compensation for displacement by the labour-saving machine.

Ten years ago the Merchants' Warehousing Co. built its first wharf-side silo, seen standing out impressively in the panorama reproduced herewith. Grain ships were discharged into that silo through a simple suction plant, at the rate of ninety tons per hour; but so rapidly has the trade of the port expanded that the Port Board was induced to build out the wharf frontage until a depth of water of 40 ft. was obtained. The company then placed a contract with the Seck Machinery Co., of London, for a combined suction-conveyor discharging plant having an hourly capacity of 225 tons. The main, transverse and spur gantries enclosing the conveyor-belts, and supporting the suction pipes; the central weigh-house; and the two travelling suction-towers, are shown in the illustration, but the twelve circular steel silo cells, each 21 ft. in diam. by 95 ft. high, holding in all 9,000 tons, are obscured by the ferro-concrete silo. This picture shows also, on the extreme right, another conveyor gantry which connects the adjacent Port Mills to the silo. In that mill there are two 250-h.p. motors and a host of smaller ones.

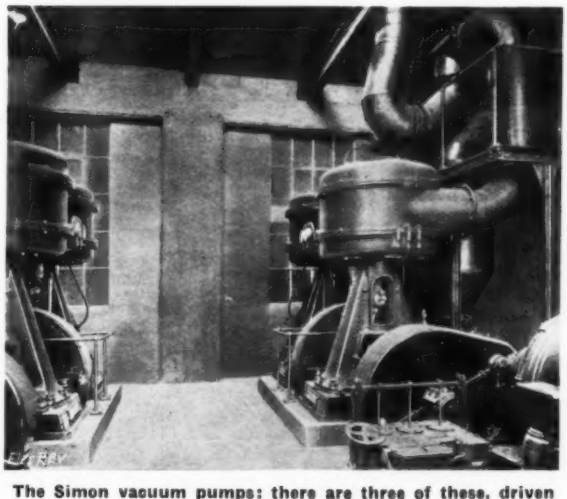
The two travelling towers in action

A general view of the grain-handling plant at Alexandra Basin, Dublin

The Pumping System

Henry Simon, Ltd., Stockport, made the three vacuum pumps, which are the prime-movers of the grain from the vessels' holds. They are of the standard Simon twin, double-acting, vertical, reciprocating type, each cylinder being 37 in. diam. by 12 in. stroke. They are driven at 140 r.p.m. by 130-h.p. 585-r.p.m. motors, through double-helical gears. The suction and exhaust valves, of which there are eighty-four to each cylinder, are placed immediately above and under the piston. They are made of heat-treated steel, and each is a complete unit with seats, spindles, spring and cap. The cylinders are jacketed, and are of cast-iron of sufficient thickness to permit several re-borings during the life of the pumps. Each of the three pumps can discharge from seventy-five to eighty tons of grain per hour at from 11 to 14 in. vacuum.

Suction pipes about 280 ft. long run from these pumps to air filters placed in the central weigh house. Thence the suction system continues through duplicate air pipes carried over the transverse gantries, to which connection is made to the two travelling towers at any of the flanged junctions, which are spaced about 16 ft. apart. Electrically driven luffing jibs manipulate the grain suction pipes on the ship side of each tower, while an electrically operated jib on the silo side carries a band conveyor, connecting with the band conveyors in the transverse gantries, as well as the air line to the cyclone-type dischargers mounted one in each tower. In order that the grain which is being sucked from the hold into the cyclone discharger can be discharged without admitting free air and thus breaking the vacuum in the pipe line, the bottom of the discharger is fitted with a rotating grain valve having six pockets, which continuously revolves in a close fitting cylinder having an opening at the bottom through which each pocket in turn discharges the grain.

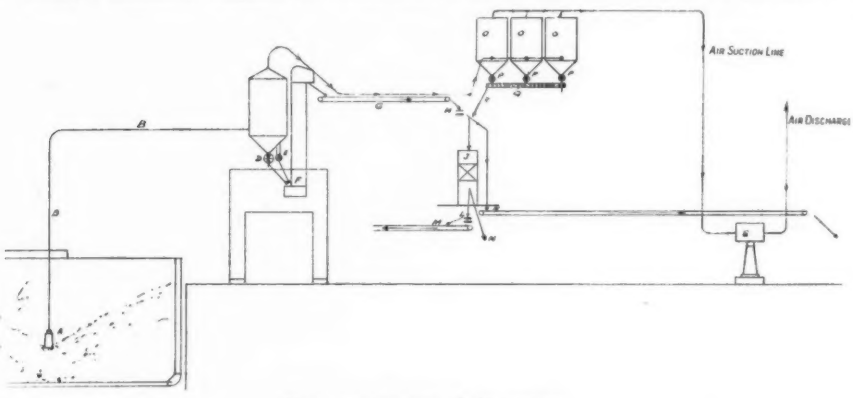


The Simon vacuum pumps: there are three of these, driven by 130-h.p. motors

There is also a second rotating valve of the same type fitted alongside the grain valve, which discharges the dust previously taken out by the cyclone back again into the grain stream so that no loss of weight occurs. The reason for placing the cyclone at this point is to relieve the work on the subsequent air filters. A 5-h.p. motor driven through worm gearing operates both these valves. The grain from the grain valve falls into an elevator having a capacity of 150 tons per hour, which is driven by a 15-h.p. motor. This elevator lifts the grain up to the band conveyor in the jib on the silo side of the suction tower, which in turn discharges it to the conveyors in the transverse gantries, and so to the central weighing house. The

jib band conveyor is driven by a 6-h.p. motor through "Fabroil" gears.

The grain arriving at the central weigh house passes over conveyors direct to the silos, or it is diverted through "Avery" automatic weighers (of which there are six, each having a capacity of twenty-five tons per hour) either to road or rail vehicles at the foot of the tower, or to belt conveyors in the transverse gantries for delivery in sacks or in bulk through the spur gantries to barges alongside the wharf.



The arrangement of the system

A, suction nozzle; B, grain suction pipe; C, cyclone discharger; D, grain valve; E, dust valve; F, 150-ton elevator; G, jib band; H, transverse band; J, 25-ton-hour weighers; K, band to silo; L, transverse sack band; M, spur gantry band; N, delivery to road and rail; O, air filters; P, dust valves; Q, dust worm conveyor; R, shute conveying dust to main grain stream; S, air pumps.

Mechanical Handling

In the upper part of this central house are arranged three air filters driven by 5-h.p. motors, which remove the dust from the air on its way to the pumps, thus preventing undue wear on the latter. Each filter is fitted at the bottom with a rotating air seal discharger, and the dust itself is conveyed by a worm conveyor and returned into the main grain stream so as to avoid loss of weight as between ship and delivery. The filter dischargers are driven by a 5-h.p. motor and the worm conveyor by a 4-h.p. motor. The conveyors in the gantries are driven by one 35-h.p., two 24-h.p. and two 10-h.p. motors.

When the grain arrives at the silo, it is divided between three 75 tons per hour elevators, which deliver it into three Avery automatic weighers with a capacity of one ton per discharge. These elevators are driven by three 7½-h.p. English Electric motors. The grain, after passing the weighers, is lifted up by three further 75 ton per hour elevators to the top of the silo for distribution. These latter elevators are each driven by 15½-h.p. English Electric motors. In order to cope with the increased capacity of the suction plant, these elevators are now all being reconstructed for a capacity of 90 tons per hour, and the h.p. will be increased to 15½ and 28½ respectively.

Power supply for this considerable installation is derived from two independent sub-stations on the Dublin e.h.v. system fed from the national network. Three 0.3-sq. in. three-phase l.v. cables have been brought across from the Port Mills sub-station to a switchboard in one of the pump rooms, and a 0.4-sq. in. cable is taken straight to the gantries from another sub-station near by. Provision has been made for the cross connection of these in the event of failure at either station, as it is highly important that vessels shall be discharged without interruption.

The busbar chambers, isolating and other switches of 600-A rating were supplied by the A.E.G., who were sub-contractors to Miac of Braunsweig for the whole of the electrical equipment, except where otherwise stated. I am indebted to Mr. T. R. McCullagh, managing director of the company; to Mr. Coote, resident engineer at the silo; and to the Seck Machinery Co., Ltd., and Henry Simon, Ltd., for their assistance.

A New Discharge-lamp Installation

LAST week we visited Wembley to view the 1¼ miles of the Watford Road lighted for the Wembley Urban District Council by the North Metropolitan Electric Power Supply Co. Forty-six 420-W "Osira" lamps, developed in the research laboratories of the General Electric Co., Ltd., are employed, as a result of the success of the experimental installation at East Lane, Wembley, which was put into operation on June 22nd, 1932. The gaseous-discharge lamp differs from all its predecessors in that its light is not dependent upon radiation from heated solids but upon the electrical excitation of vapour. Energy is acquired by individual atoms through collision with ions and electrons, and this energy is released as light.

The "Osira" lamp consists essentially of two electrodes at opposite ends of a glass tube enclosed in a vacuum jacket. Only two leads are taken into the lamp, which has a standard Edison screw cap. The lamps can be made for either "cap-up" or "cap-down" positions. The source of light is in the form of a narrow cord, 6 in. long and ¼ in. in diameter. No special gear is needed to start the discharge or to heat the electrodes. Full illumination is reached within about three minutes of switching on, during which time the voltage across the lamp rises and the mains current falls to 2 A from about three times that figure.

A series impedance is required, as the characteristic of the lamp is similar to that of an arc lamp. The current through the lamp is not sinusoidal and the power factor cannot be calculated from the inductance and capacity; also, the power factor is lowered by the use of the series choke. Correction from less than 0.5 to 0.83 can be made by installing a 20 μF condenser at each unit. The overall efficiency, including reactance losses, is about 38 lumens per W, compared with 15½ for the tungsten gasfilled lamp. The efficiency of the lamp alone is 39 lumens per W; its life is said to be at least equal to that of the tungsten lamp.

The Colour of the Light

The spectrum consists of lines in the yellow to blue spectrum, and fainter ones in the yellow and orange; in addition a certain amount of continuous spectrum extends from the blue to the orange regions. The design of the copper lanterns is a radical departure from general practice. Diffusing glass is used for the bottom and curved end of the fitting and the over-reflector is of white enamel. The object has been to produce satisfactory general diffusion with extensive light distribution up and down the road, and in our view this has been achieved. An important feature is that the light is distributed over the whole roadway in such a manner that a higher intensity is directed away from the driver than towards him.

The lamps are alternated on each side of the 30-ft. carriage way, which is bordered on each side by the 14-ft. footway and grass verge. The lamps do not overhang the carriage way; the light centre is 25 ft. above ground and the average spacing is 117 ft. The diversity of brightness along the road is 1.4 to 1 and the ratio of maximum to minimum illumination is 5.5 to 1 with a rated average illumination of 0.75 ft. candles (British Standard class D). A choke and condenser are installed in the base of each lamp pillar.

During a short preliminary talk, Mr. C. C. Paterson (director of the G.E.C. Research Laboratories) showed us some carbon dioxide tubes which give almost perfect colour rendering at the expense of a relatively low efficiency, and a sodium lamp the high efficiency of which was offset by the loss of colour discrimination. We also inspected the colour floodlighting of the exterior of the laboratories. The illumination was notably even in its intensity, and the rectangular projectors were certainly an improvement in appearance over the gallipot type used in ordinary installations.

At a dinner following the inspection, Sir Hugo Hirst, Bt., said that though his company had had to economise, it had not cut down research. The "Osira" lamp was the product of team work in the laboratory, in which Mr. J. W. Ryde had been prominent. Brief speeches were also made by Mr. C. J. Life (chairman, Wembley U.D.C.), Capt. J. M. Donaldson (chief engineer, Northmet Co.), Lt.-Col. M. F. Kittoe (High Sheriff of Middlesex), and Sir Chas. Pinkham (chairman, Highways Committee, Middlesex C.C.). Mr. H. W. Gregory (resident engineer, Northmet Co.), whose co-operation was especially recognised by Mr. Paterson, was also among those present. Illustrations appear on page 341.

The Uhl River Scheme

THE Uhl River (or Mandi) Hydro-electric Scheme, which is to be opened to-day by the Viceroy of India, is exceeded in capacity on the sub-continent only by the Tata undertakings, near Bombay. Attention was first drawn to the potentialities of the water-power source by Mr. J. W. Meares when electrical adviser to the Government of India, and a power station has been built in Mandi State about 200 miles north-east of Lahore. The project utilises a 3,000-ft. difference in level between the Uhl and Rana Rivers, and the first stage deals with an average daily flow in the former of 150 cu. ft. per sec. at 1,800-ft. head.

The scheme, including transmission and distribution systems, has taken seven and a quarter years to construct, and the capital cost is estimated at Rs.6¾ crores (about five million sterling). To provide power during construction 900-kW and 480-kW hydro-electric stations were erected at Dhelu and at Thuji. Housing accommodation was also provided for 5,000 employés.

A 9¼-ft. circular tunnel, 2¾ miles long, for a discharge of 600 cu. ft. per sec., was bored through a spur of the Dhanladhar range, the excavated rock being brought out by an English Electric ten-ton electric locomotive driven either from a battery or from a trolley wire. Near one end of the tunnel is a surge shaft 375 ft. deep and 12 to 16 ft. in diameter, from which two parallel tunnels lined with steel pipes 6 ft. in diameter, 1,200 ft. long, are taken. One is at present blanked off, and the other is ultimately divided into four pipes, 2 ft. 7 in. in diameter, each carrying 100 cu. ft. per sec.

The power house is a steel-framed building, reinforced to resist earthquake shock. The four 428-r.p.m. single-jet water wheels (the largest constructed in Great Britain) drive 12,000-kW 11-kV alternators. The output is estimated at 154 million kWh per annum. Four similar sets will be added later.

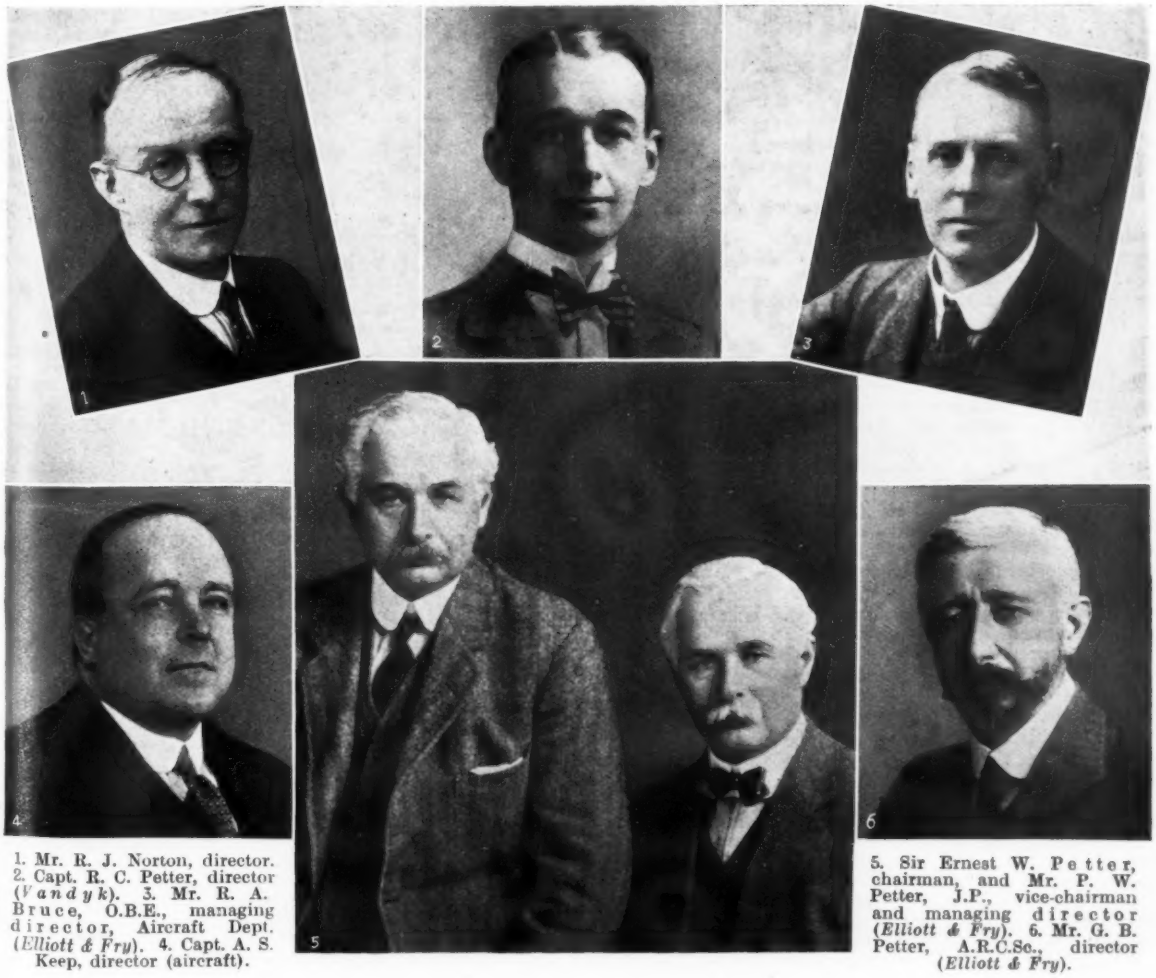
A double-circuit 132-kV line runs from Jogindernagar to Lahore (173 miles), with 139 miles of branch lines. The power conductors are of steel core aluminium and are supported on galvanised steel towers normally situated 1,000 ft. apart, but 3,400 ft. apart in the hilly district. Bulk supplies will be offered to existing undertakings at Lahore, Amritsar, and Jullundur, and to the N.W. Railway at Lahore. A bulk supply is to be given to the Mandi State, and agreements may be made with the States of Kapurthala, Faridkot, Malerkotla, and Nabha. In thirteen towns supplies will be given direct through local distribution systems, and in others similar schemes are under consideration.

Electricity will be available directly or indirectly to an urban population of 1,250,000, but it is hoped that electricity will also be used by agriculturists, especially for pumping. The industrial tariff favours the consumer using electricity in increasing quantity. The "all-in" domestic tariff will enable supply to be taken through a single meter.

The commercial manager of the undertaking is Mr. A. R. Astbury and the chief engineer Mr. H. P. Thomas (since the death of Col. B. C. Battye last year). Consultants on the scheme included: Mr. S. G. Forbes (electrical engineer, Mysore Government), Sir F. St. J. Gebbie, Mr. W. P. Sangster, and Messrs. Merz and McLellan (for the project as a whole), with whom were associated Sir Alexander Gibb & Partners (for civil engineering). Messrs. Preece, Cardew & Rider were also consulted in respect of the construction of tunnel and main penstock pipes, generating plant and power-station switchgear; Messrs. Kennedy & Donkin, transmission lines, sub-station switchgear and transformers; Mr. C. E. Blaker (principal, Government School of Engineering); and Mr. E. S. Brown, telephone equipment.

The principal contractors were: B.T.H. Co., Ltd., turbines, generators, switchgear, transformers, &c.; Callender's Cable Co., transmission and telephone lines; Glenfield & Kennedy, hydraulic gates, valves and screens; English Electric Co., synchronous condensers; Herbert Morris, Ltd., cranes; Bullers, Ltd., and Jeffery Dewitt Insulator Co., insulators; U.S. Steel Products Co. and American Bridge Co., towers; Boving & Co., water wheels.

Some Driving Forces in the Industry: Petters, Ltd.



1. Mr. R. J. Norton, director. 2. Capt. R. C. Petter, director (*Vandyk*). 3. Mr. R. A. Bruce, O.B.E., managing director, Aircraft Dept. (*Elliott & Fry*). 4. Capt. A. S. Keep, director (aircraft).

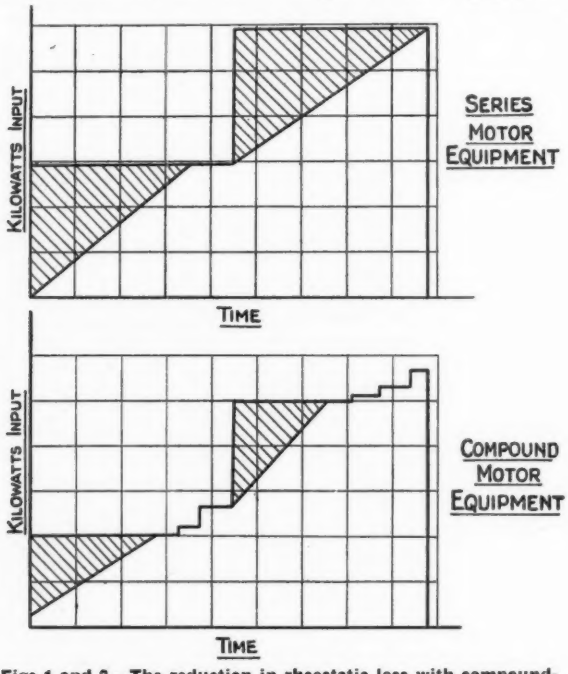
5. Sir Ernest W. Petter, chairman, and Mr. P. W. Petter, J.P., vice-chairman and managing director (*Elliott & Fry*). 6. Mr. G. B. Petter, A.R.C.Sc., director (*Elliott & Fry*).

Tramway Regenerative Control

A study of the factors affecting the saving in energy consumption

DURING the past few years a considerable amount of experimental work has been carried out in connection with regenerative schemes for tramways, and trial equipments have been installed by ten tramway undertakings on the Continent and by two in this country. A large majority of these equipments have shown a marked economy in energy consumption over the standard series motor and a monetary saving usually sufficient to pay off the cost of conversion in a few years. In Paris the work of converting series motor equipments to compound-motor equipments has been in hand for some time and about seventy regenerative cars are now in use.

In this country experience gained with trial cars in Manchester and Glasgow has enabled the manufacturers to overcome the troubles inevitable with new types of apparatus, and it is claimed that similar compound motor equipments



Figs 1 and 2.—The reduction in rheostatic loss with compound-wound motors (shaded area shows rheostatic loss)

with series-parallel control will give all the advantage of regeneration without in any way sacrificing any of the advantages of the modern series motor. The amount of energy saved will vary considerably on different routes, the economy of the regenerative cars increasing with the rise in schedule speed, number of stops, and severity of gradients. Where new equipments are required, the additional cost of adopting regeneration is small, and the extra cost can be paid off in a short time, even on routes having easy schedules. There are also many tramway systems where the schedules are sufficiently fast or the gradients sufficiently steep to justify the conversion of modern series equipments or the replacement of old series motors by new compound motors.

The cost of such conversion or replacement will be greater than the difference in cost between new equipments of each type, and consideration must be given to the reduction of operating costs to be obtained in each case. Such a reduction is dependent, either directly or indirectly, on the saving in energy consumption, and the purpose of this article is to indicate the factors affecting the reduced consumption with compound motors and to give data from which an approximate estimate can be made for most routes.

The motoring energy to operate a car is the sum of the following—work done in overcoming tractive resistance (w_t); energy dissipated in brakes (w_b); and gain or loss of potential energy due to change in altitude (w_p). The energy to be supplied at the car wheels (this becomes equal to zero on gradients where the car can be started and run without applying power) is $w_t+w_b\pm w_p=\mathrm{W}_w$. Adding losses in the motor corresponding to an output W_w (W_m) and in starting resistances (W_r), the motoring energy drawn from the line is $\mathrm{W}_w+w_m+w_r=\mathrm{W}_l$.

With series motors the whole of the electrical input (W_l) is converted into heat or, if the car is ascending a hill, into potential energy. With compound motors, however, a part of w_b is returned to the line as regenerated electrical energy, while in addition w_r is reduced for two reasons: acceleration is controlled largely by weakening the shunt field, thus reducing the amount of resistance required, and a strong shunt field is used during acceleration on the resistance notches, so that for a given tractive effort the armature current is reduced with a corresponding reduction in resistance loss (*i.e.*, the free running notch is reached at a lower speed).

There will also be a difference in the value of the motor losses (w_m), which is generally in favour of the compound motor at high schedule speeds and in favour of the series motor only when the cars are working a schedule very much easier than for which they were designed. In most cases the difference in motor losses may be neglected in making an approximate estimate.

Reduction in Rheostatic Losses

Figs. 1 and 2 show the relative performance of an equipment first with series windings and then with compound windings when accelerating at 1.5 m.p.h.p.s. on a gradient of 1 in 85 up, this acceleration being near the maximum of which the equipment is capable. The shaded area in each figure represents the loss in the resistances, which is very much smaller with the compound motor. Detailed calculations show that, taking the input to the series equipment as 100, the loss in resistances of series equipment = 27 per cent., the loss in resistance of compound equipment = 12 per cent., and the input to the compound equipment = 85 per cent.

The input to the series motor includes a short period of free running, and if this is deducted the resistance losses become in the series motor equipment 30 per cent., and in the compound motor equipment 13 per cent., or a saving of 17 per cent. of the input to the series motor equipment while on the resistance notches. The proportional saving will increase when accelerating at lower currents, since under these conditions the field of the series motor is relatively weaker, while that of the compound motor is only slightly reduced, and a conservative estimate will therefore be obtained if a figure of 17 per cent. is used. This saving will be of considerable importance on routes having a large number of stops per mile, as the input on resistance notches will be a large part of the total input. The input to the series equipment on the resistance notches can often be estimated fairly closely from a knowledge of the service conditions, but it may also be measured by a car meter having its current coil connected in the last resistance step.

The Recovery of Energy

The electrical energy returned to the line by the regenerative equipment is obtained from that part of the input which would be absorbed in the mechanical or rheostatic brakes on the non-regenerative car. Theoretically, the whole of this brake loss is recoverable, less the losses in conversion from mechanical to electrical energy, but equipments suitable for regeneration down to standstill involve the use of boosters or other auxiliary machines, and it is doubtful if the small additional saving obtained will justify the extra first cost and maintenance cost of the special equipment.

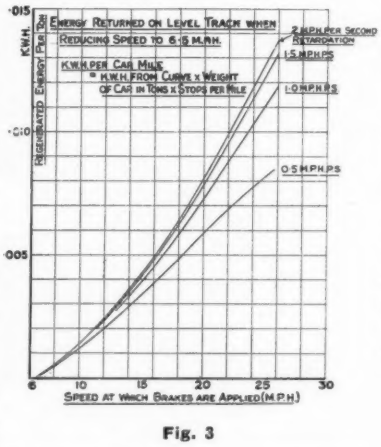

·015
·010
·005
KWH. REGENERATED ENERGY PER TON
ENERGY RETURNED ON LEVEL TRACK WHEN REDUCING SPEED TO 6·5 M.P.H.
2 M.P.H.P.S. PER SECOND RETARDATION
1·5 M.P.H.P.S.
1·0 M.P.H.P.S.
0·5 M.P.H.P.S.
KWH. PER CAR MILE = KWH. FROM CURVE × WEIGHT OF CAR IN TONS × STOPS PER MILE
6 10 15 20 25 30
SPEED AT WHICH BRAKES ARE APPLIED (M.P.H.)

Fig. 3

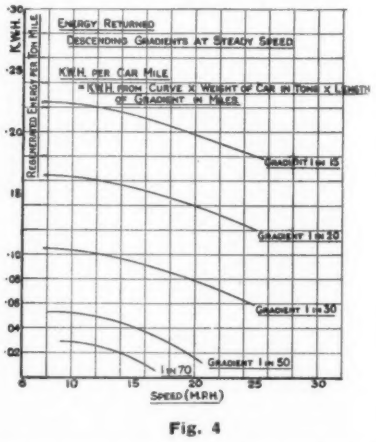


Fig. 4

With compound-motor equipments arranged for series-parallel control, energy can be regenerated from the maximum speed down to between 7 and 5 m.p.h. for the usual range of speeds required on tramways in this country; for an approximate estimate, 6.5 m.p.h. may be taken as the minimum regeneration speed. For a car running on the level, the total energy to be absorbed during the braking period is the kinetic energy in the car at the speed at which the brakes are applied. Expressed in electrical units, and allowing 7½ per cent. for the kinetic energy in the rotating parts, this equals 0.0000304 v^2 kWh per ton, where v = speed in m.p.h. at which the brakes are applied.

A small part of this energy will be used in overcoming tractive resistance during the braking period, but between v m.p.h. and 6.5 m.p.h. the remainder of the energy is available for return to the line as electrical energy. This equals kinetic energy at v m.p.h. − kinetic energy at 6.5 m.p.h. − work done against tractive resistance between v and 6.5 m.p.h. or $w_R = n\ (0.0000304\ v^2 - 0.0013 - \frac{T \times D}{2655000})$, where w_R = kWh per ton returned to the line at each stop; n = efficiency of conversion to electrical energy; T = average tractive resistance in lb. per ton; D = distance in ft. run during speed change from v to 6.5 m.p.h.

The efficiency of conversion will vary with the rate of braking (*i.e.*, with the regenerative load on the motors), but will be over 80 per cent. at full load. For an approximate estimate an average efficiency of 80 per cent. may be used for retardations required in normal service. Knowing the speed at which the brakes are applied and the average retardation, the energy regenerated per car mile equals kWh from fig. 3 × weight of car in tons × stops per mile.

The Effect of Gradients

On a route where the brakes are applied at widely different speeds the regenerated energy should not be calculated on the average speed at which braking is commenced, but on the r.m.s. value of the speed. $v_{rms} = \frac{v_1^2 + v_2^2 + v_3^2 \ldots}{\text{no. of stops.}}$ This correction is necessary since regenerated energy is approximately proportionate to the square of the speed.

When stopping a car on an up or down gradient the energy available for conversion will be decreased or increased by the change in potential energy over the distance run while retarding the car with the regenerative brake. A considerable time would be required to calculate the effect of gradient at each stop, and as an approximate estimate it may be assumed that the loss in regenerated energy when stopping on an up gradient will be equalled by the gain in regenerated energy on the return journey when stopping on the down gradient. This assumption is justified if the calculations are based on a round trip; the number of stops is approximately the same both up and down the gradients; and the retardation is fairly high in both directions (with high retardations the change in potential energy will be small, so that any errors introduced by the assumption will be negligible).

The effect of long, steep gradients cannot be neglected if the brakes have to be applied to hold the car at a steady speed. The amount of energy which can be regenerated under these conditions is n (change in potential energy − work done against track resistance), or $w_R = n\ (4.46R - 0.00199T)$; where w_R = energy returned to line (kWh per ton mile), R = gradient (*i.e.*, if gradient is 1 in 10, then R = 0.1), T = tractive resistance in lb. per ton at steady speed, n = efficiency of conversion to electrical energy.

The total energy regenerated per car mile will be kWh from fig. 4 × weight of car in tons × length of gradient (in miles) over which speed is held steady by use of brakes.

The Economies Effected

The total saving to be expected by adopting compound motors is :—

(*a*) A reduction in input during acceleration of approximately 17 per cent. of the input to the car with series motors while on the resistance notches.

(*b*) Regeneration at stops, which can be estimated with the aid of fig. 3. If the route under consideration has city and suburban sections with widely different schedules and two sections should be considered separately. If the estimate is based on a round trip for each section, the effect of stopping on gradients may usually be neglected.

(*c*) Regeneration at steady speed on gradients which may be estimated with the aid of fig. 4. (It is important to note that the length of gradient to be considered is that part over which the speed is to be held steady.)

On routes through heavy traffic or narrow streets, when the speed must be checked frequently, an allowance should be made for the additional saving obtained with the regenerative equipment. This allowance can conveniently be made by increasing the number of stops in calculating (*b*) above.

Practically all the data required for this method of estimating the saving to be expected by the use of a compound-motor equipment is either known to the operating engineers or can be obtained by observations on an existing series-motor equipment, and it should provide them with a rapid means of estimating the value of regenerative equipments on their own systems. It must, however, be emphasised that the results will be only approximate, and a detailed investigation should subsequently be made with the assistance of the equipment designers.

The new lighting system described on page 338. Left: The "Osira" electric discharge lamp. Centre: A view of the Watford Road, Wembley, under the new system. Right: One of the fittings which are employed

Three Aspects of Railway Traction

AMONG the papers recently presented to the Institution of Civil Engineers in London is one by Mr. C. B. Unwin on "Electric Trains for Services with Frequent Stops." He says that there is need for considerable research into materials for brake blocks, and for improvements in the design of motors is possible in the direction of more efficient enclosure and the use of roller armature bearings. Mr. H. W. H. Richards discusses "Primary Considerations Relating to Steam, Electric, and Diesel-electric Traction." An attempt has been made to ascertain the fundamental differences in operating characteristics, and in the capital and maintenance costs, and to deduce therefrom the "best" methods available for meeting railway transport requirements and future developments. No recommendation is made, since each case must be considered on its own merits, allowance must be made for "outside" conditions, and developments will undoubtedly affect costs and results. Mr. W. S. Graff-Baker deals with "Some Features of Design in Electric Rolling Stock for Intense Service," and describes methods adopted by the London "Underground" group.

Science and Industry

THE annual report of the Department of Scientific and Industrial Research for the year 1931-32 (H.M. Stationery Office, Cmd. 4254, price 3s. net) expresses "the earnest hope that the protection which has now been afforded to certain industries in the home market will be regarded as an opportunity for effecting the changes in organisation, the installation of modern plant, the development of research work, and the employment of educated staffs which the experience of the last few years has shown to be necessary in some industries if they are to compete on level terms with industries in other parts of the world."

Reference is made in the report to the recent development of narrow brick retorts for the low temperature carbonisation of coal at the Fuel Research Station, and to the recording of the momentary forces which concrete piles have to withstand when being driven in as foundations of big buildings. The mechanical forces are converted into electrical forces by quartz crystals embedded in the pile, and are then recorded by the cathode ray oscillograph.

Better Lighting

Investigations of the glare effect of various systems of street lighting and of coloured light sources are in progress to find the best beams for traffic control signals, while measurements of the transmission factors of coloured railway signal lights have also been made. A survey has been carried out on the lighting of docks, quays, and their approaches, and some experiments are being made with a view to finding ways of minimising the effect of reflections in shop windows. Tests have also been made, by the aid of models, on the effect of window size and the colour and reflecting power of walls on the daylight lighting of rooms.

X-ray methods are being used at the National Physical Laboratory for studying the brilliance and hardness of chromium-plated coatings, tungsten magnet steels, transformer steels, drawn resistance wire, protective scales on steel and paint materials. High temperature tests have been carried out on steels and alloys, and specially designed apparatus is being used at the National Physical Laboratory to determine the susceptibility of such materials to the corrosive attack of flue gases and preheated steam, while "creep" is being measured at rates as low as $\frac{1}{10}$th of a millionth of an inch per inch per hour.

Electrical Research

Reduction of fire risks and increased life in the conducting leads in gasfilled lamps used for office and factory lighting have been brought about by the work of the Electrical Research Association, which has found means of reducing the temperature rise in the fittings for such lamps from about 100 to 33 deg. C. It has also developed simple portable apparatus by which soil heat conductivity can be measured along a proposed cable route, so that the correct size of cable can be laid. The problem of the proper earthing of electrical installations has also been studied, including the treatment of earth plates with various salts intended to reduce the resistance of the ground in difficult localities. An investigation has also been substantially completed on the cause and prevention of interfering noises on telephone lines.

Among numerous researches referred to in the report are investigations of the reliability of electric fusion welding in steel-framed buildings, pulverised fuel burners, means of freeing fine coal from dirt, the study of the propagation of wireless waves of 1.6 cm. and upwards, and the production of waves only a few centimetres long. Important researches on the effect of the upper atmosphere on wireless signals are being carried out by a team sent out by the Department to Tromso in the Arctic Circle.

The twenty-nine British patents which were applied for during the year included radio direction finding apparatus, methods of automatic monitoring of the frequency of a radio transmitter or oscillator, and improvements in wireless signalling.

The total net expenditure of the Department during the last financial year was £534,700. The report concludes with an expression of the Department's anxiety to foster close relations with industry. It says that the various research organisations are not close corporations but public concerns for the promotion of the public well-being and the assistance of industry.

Support National Effort

PLEAS for more support for the Association and for the holding of a National Electrical Convention were made at the dinner of the South Midland Area of the British Electrical Development Association held at Birmingham on March 1st under the chairmanship of Mr. E. J. Jennings, commercial manager and secretary, Birmingham Electric Supply Department.

Mr. C. H. Cox, chairman of the E.D.A. Council said that had the six hundred undertakings supported the last cooking campaign of the Association the special brochure produced for the occasion would have entered 4,000,000 homes. As it was only sixty undertakings gave their support and the brochure was received in only 400,000 homes. The need for an efficient central body for guiding, leading and urging on the sales side of the industry was never more acute than it was to-day. With the whole industry pulling together nothing should prevent it from increasing the present 230 kWh per head of population to three or four times the figure in a short time. E.D.A. had given the industry a handsome return for the small amount of money invested in it, and the education of the public in domestic electricity during the years 1919 to 1929 had been the salvation of the supply undertakings. The domestic consumer must be for some time yet the principal source of the industry's revenue.

Mr. Jennings said he had pleaded for a national convention —it was only as a solid team that the industry could serve the public properly. Sir Andrew Duncan, chairman of the Central electricity Board, said that the electrical industry was the one industry which had grown steadily during the past few years of depression. That had been partly due to the public having become electrically minded, and partly due to the efforts of E.D.A.

We were now entering a new era in electrical developments; the grid had created a new opportunity which none could afford to miss. He pleaded strongly with the electrical undertaker to let no prejudice for the "home produced article" blind his efforts towards salesmanship. The grid was playing a big part in the decentralisation of industry, and electricity supply was entitled to be regarded as a real basic industry. No other country had evolved such a scheme for the national production of electricity.

Councillor H. K. Beale, president of the National Chamber of Trade, in a speech of facts rather than fancies, showed that this country had held its own industrially favourably as compared with many other large nations. Electrical development, he said, could not find its full opportunity apart from general industrial revival. Supply undertakings had to encounter much the same difficulties and problems as confronted distributors in general. To find compensation for the losses experienced by the staple industries in various markets there would have to be expansion in fresh fields, of which electricity was a noteworthy example.

Electricity Supply in Palestine

THE illustrations on page 335 relate to the Rutenberg electricity supply scheme of the Palestine Electric Corporation registered in London. The main power station is situated at Tel Or (" Village of Light "), at the confluence of the Yarmuk Falls and the Jordan, just south of the Sea of Galilee. The works are known after Mr. P. Rutenberg, the founder of the scheme and chief director of the Corporation. The Corporation has standby power houses at Tel-Aviv, Haifa, Tiberias, and on the Jordan.

The Corporation has a share capital of £P.1,000,000 (Palestinian pounds valued slightly more than sterling), of which £P.800,000 has been paid up. One of the principal shareholders is the Zionist organisation, which has subscribed through the funds administered by it for Palestine development (Palestine Foundation Fund) the sum of £P.103,000. Two series of debentures have been issued, one amounting to £250,000 bearing 5 per cent. interest and the second to £300,000 bearing 6 per cent. interest.

In 1927 2,500,000 kWh was sold, but for the first few months only of 1932 the amount was 8,700,000 kWh. The number of consumers in Palestine in 1927 was 7,477, at the end of 1931 12,029, and 1932 has shown a still further increase. The length of cables in 1927 was 74½ miles, and at the beginning of 1932 397 miles. Industries consumed 1,750,000 kWh in 1930 and 3,100,000 kWh in 1931.

The power house at Tel Or was commenced in September, 1927, and finished at the beginning of 1932, and is in a position to supply 65,000,000 kWh per annum. It is hoped to supply the whole of Palestine and Trans-Jordania with electricity, both domestic and industrial, except Jerusalem, where the existing electricity supply scheme is not within the scope of the P.E.C.

The Making of Large Switches

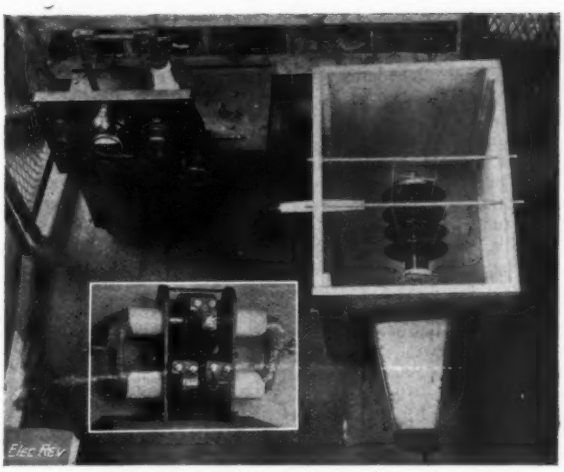
Complicated structures simply produced

A MODERN high-voltage high-capacity switch can appear, even to an electrical man, somewhat overwhelming, especially when it is complicated by numerous instruments and interlocks such as are associated with grid equipment. But even so we left Chalfont, Bucks, after a very interesting day in the works of Messrs. J. G. Statter & Co., Ltd., with the feeling that the production of heavy switchgear was quite a simple business. We do not mean to imply that switchgear manufacture does not require the greatest skill in design and workmanship, for the contrary is the case, but, generally speaking, only ordinary modern engineering workshop equipment and methods are employed.

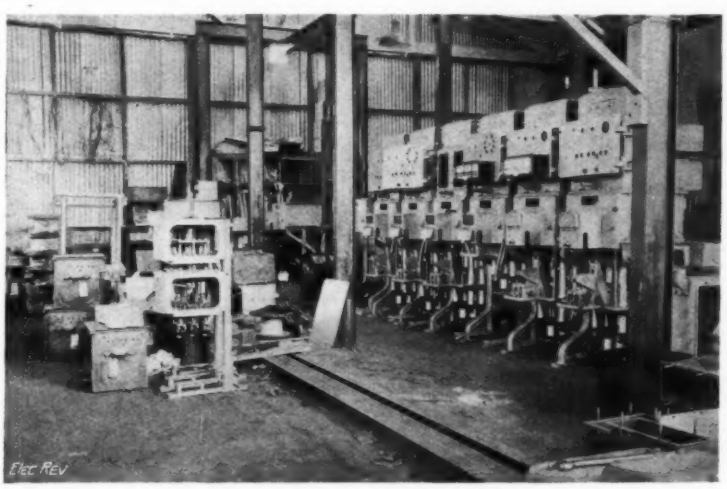
Nearly all the parts, except the actual castings, are made in the company's shops, including the switch contacts. An excellent illustration of the stamping work is the top plate for "A1" circuit breakers. In one piece it retains the breaker operating mechanism and the overload and no-volt coils, and it supersedes the several small castings formerly employed. Sockets are turned from copper tube, and brush laminations are cut from strip spool-fed on to a converted lathe fitted (by the company) with micrometer adjustment for correctly obtaining the various lengths. A special machine produces a fine contact surface on the brush laminations by its sweeping cut.

Modern electro-deposition equipment is employed in the factory. Tinning is employed generously for most auxiliaries; the silver-plating of circuit breaker contacts reduces the contact heating effect by 40 per cent. In the finishing shop spray painting is employed solely. In conjunction with a scheme of works extensions individual driving is gradually being adopted for the drilling machines, automatic lathes and other machines, and electric welding is employed extensively for frame work fabrication, and other work, and especially good service is obtained from the welding equipment, which is employed for battery charging at night. Bull Motors, Ltd., supplied the 7-h.p. generator, and its current rating at the charging pressure of 80 volts is 150 A.

The batteries afford the heavy current supplies for load testing, and portable and other transformers serve for pressure work. During our tour we saw under construction a "dark room" for testing the discharge on the porcelains of current transformers, &c., and before we left, after witnessing a test, we secured the above photograph. The transformer affords up to 35,000 volts test pressure. Gradually reducing the voltage from about 20,000 the discharge round the end of the porcelain disappeared at about 15,000 volts. The company makes its own current transformers from the straight-through ring type up to the 11 kV-air-insulated type. A recent development is one with three secondaries, the single coil (see illustration) serving for precision metering.



Insulator in "dark room" (tilted) for porcelain discharge test, employing a variable-voltage (35-kV) transformer. (Inset: A recently developed current transformer with three secondaries)



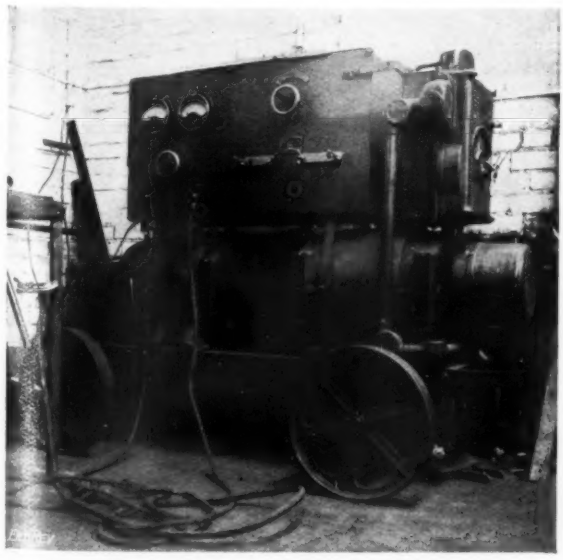
Assembly bay in the works, showing 11-kV grid switchgear under construction, and, on the left, a 3.3-kV industrial set

An 11-kV board was being built for the Central Electricity Board for use in the Yorkshire Electric Power Company's area. Feeding from the busbars is down one side through porcelain insulators and back on the opposite side through current transformers in oil, rendering them easily replaceable. The automatic features ensure that when the switch is in it automatically trips before the isolating plugs leave their sockets. With the switch lowered the tank can be released and the switch mechanism raised to a limited position to permit examination of the contacts and all parts without withdrawing anything.

The V-shaped contact bars (hollow so that they "pump" oil on to the sparking points at the ends) are all operated from one main spindle. Major Marston, works manager, explained that this eliminated the difficulty of getting two spindles to work together. Boxes at the back of certain units, each forming a downward continuation of the connection box, accommodate extra transformers for special trips, &c. When opened, the hinged instrument panel reveals a complete terminal board which permits the testing of any relay, while alive.

For industrial use the company is developing a 3.3-kV switch of simpler construction but on exactly the same principle. It embodies an example of the company's general construction for isolation sockets. The pin is surrounded throughout its length with split rings, and the splits are "scattered" so as to give equal pressure all along.

We examined one of the new round-tank circuit breakers in which the makers' standard c.b. mechanism is fitted. This is of toggle form and is operated by bringing the arm forward, engaging a catch, which, in turn, straightens the toggle and allows it to go very slightly over the centre, thus preventing it being shaken out by vibration or shock, except when the end of the catch is struck by the operating coil.



The works welding and battery-charging generator set

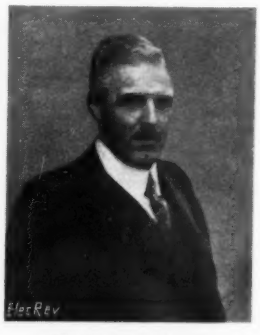
MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Power Cable Ionisation

THE important subject of ionisation in power cable dielectrics is discussed in detail in the paper which Mr. P. Dunsheath read before the INSTITUTION OF ELECTRICAL ENGINEERS in London yesterday (Thursday).

This phenomenon lies at the root of success or failure in the operation of high-voltage cables. The close connection between ionisation and long-time breakdown strength receives attention, and tentative suggestions are made for the assessment of quality. The investigations have been carried out by W. T. Henley's Telegraph Works, Co., Ltd., and the author's conclusions are that study of the difference between the pure (proportional to the square of the voltage) and total losses, and its variation with voltage, throws more light on ionisation phenomena than does the more usual study of the power-factor/voltage relationship.



Mr. P. Dunsheath

Increasing with the Voltage

The variation of power factor with voltage may show an anomaly in the form of a peak preceded by a rising and followed by a drooping characteristic, which anomaly does not appear in the curve connecting ionisation loss and voltage. Ionisation loss, when it exists, continues to rise with voltage. Rise of power factor with voltage, or the presence of ionisation loss, does not necessarily indicate the presence of gaseous voids. There is very definitely a type of ionisation which is not gaseous. It is independent of frequency and is probably electrolytic in nature.

When the ionisation-loss/voltage curve is a straight line, or a series of connected straight lines, it is due to gaseous ionisation commencing at a definite stress for a particular position in the dielectric. When it curves upward continuously the loss may be due to progressive gaseous ionisation at increasing radii, but is more probably due to non-gaseous ionisation. The presence of ionisation in a cable dielectric is not accompanied by any appreciable distortion of the charging current wave-shape or rectification effect. At voltages in the same neighbourhood the values of the long-time breakdown strengths of different samples of cable made to one common design, but manufactured or treated differently subsequent to manufacture so as to show gaseous ionisation, are in the same order as the respective ionisation losses.

The mechanism of void formation during the cooling of a length of impregnated-paper cable possesses two distinct components due to (*a*) radial movement of compound in the dielectric owing to the outer portion being the first to cool and draw compound from the temporarily hotter central parts, and (*b*) longitudinal movement of compound, probably in the interstices between the wires of the stranded conductor (*b*) is largely controlled by differential cooling along the length, and may be the more powerful of the two in producing voids and gaseous ionisation.

In a drum length of unsound cable which shows very little ionisation on test, there may be wide variations in the ionisation characteristics along the length, and the density of ionisation loss in short sections may be ten times what it is elsewhere. In such a cable, however, the pure loss does not vary appreciably from point to point along the length. In a well-manufactured cable cut-up sections do not differ appreciably one from another in the magnitude of either the pure loss or the ionisation loss. A cable which has developed gaseous ionisation characteristics, if allowed to rest for weeks without voltage or current, will slowly recover. The ionisation loss will decrease and a drooping power-factor/voltage characteristic may even change slowly into a rising one at a lower value of power factor. Application of voltage only over a prolonged period to a cable which has already shown instability is sufficient to increase the ionisation. It may also result in the development of drooping power-factor characteristic.

Temperature Effects

Loss due to gaseous ionisation may decrease, and that due to non-gaseous ionisation may increase as the temperature of the cable rises; over a wide range of temperature the result is that the ionisation-loss/temperature curve may assume the "V" shape so well known in the pure loss curve of cables containing rosin in the compound, though not to such a marked extent. An important criterion of quality in high-voltage cable is the variation in ionisation from one length to another in a consignment; the more uniform the length results among themselves the more probable it is that each length is uniform. Unsound impregnated-paper cable for high voltages may show little ionisation as manufactured and yet prove very unstable on a loading test. The application of a heating cycle, with voltage superimposed, to such a cable will raise the power factor to a considerable extent by increasing the gaseous ionisation. Details of a suitable stability test for application as a type test to differentiate between sound and unsound cable are given in the paper.

As a type test for research purposes a good criterion of the breakdown strength of a cable is the 50-hour value, the voltage at which the cable will stand up for this minimum period. The samples should be long enough to catch any weak spot (30 yards is a suitable length), and their internal conditions should approximate to those obtaining after a period of service. Proposals are made by the author for a method of breakdown test styled "long-time shooting." Definite evidence is now available that for working up to 66 kV solid-type impregnated-paper cable can be manufactured in such a way as to be entirely reliable in service.

Superconductivity

A SPECIAL lecture on "The Superconductivity of Metals Observed at Low Temperatures" was given at the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 2nd by Prof. J. C. McLennan, F.R.S., who, as the President pointed out in his introduction, for a long time held the chair of physics in the University of Toronto and, during the later stages of the war, was scientific director to the Admiralty.

Prof. McLennan said that when the electron was identified, the implications which followed the demonstration of its existence were very far reaching. At the moment we were on the crest of another wave of discovery which promised to have similarly tremendous implications. In the interval, however, we had not paid much attention to the solid state of matter, in which the electrical engineer was very much interested.

It was possible to obtain liquid and solid oxygen, nitrogen, and hydrogen, which were perfect insulators; liquid oxygen, for instance, was a far better insulator than gaseous oxygen. The influence of free electrons around an atom was shown by the fact that solid oxygen, nitrogen, and hydrogen, having no free electrons, were unable in that way to conduct electricity. The modern view of the conduction of metals was that any solid like silver, gold, copper, or lead consisted of atoms which lost electrons temporarily and carried the current. The lecturer had not the slightest doubt that the work now going on in this connection would eventually reveal exactly what the state of the atoms was inside a metal.

For forty or fifty years there had been the most intense study of the conductivity, or resistance, of metals without much progress, but in his judgment great advances would now be made by the aid of a study of the optical properties of metals. Indeed, if he were a young man he would spend a great deal of time on this type of investigation, and he believed that with the aid of medium-length radio waves the required information would be obtained.

Approaching Perpetual Motion

When a small ring of lead was enclosed in liquid helium which, in turn, was enclosed in liquid air the lead became superconducting if a current was induced in it at a temperature below 7.33 degrees. As long as the helium existed the current continued unabated, and that was the nearest approach to perpetual motion that he had yet come across. The lead ring was then a perfect conductor so far as he knew. That same property was possessed by other metals at different temperatures, and to a large extent the single elements which were superconducting at low temperatures had been ascertained. They included lead, tantalum, tin, indium, thallium, thorium, and gallium. There were possibly others, and this work had been carried down to 7 degrees. Furthermore, by studying the vapour pressures of the elements it was possible to read with the greatest accuracy to within 1,000th of a degree when the change took place. The point was, however, what happened to the conductivity when the change came on suddenly? For instance, niobium (which was called columbium in America)

became a conductor at the highest temperature of any, a little over 8 deg. Personally, he believed the key was the fact that niobium was capable of supplying a large number of free electrons.

The first attempts to work in this direction were made with metals as pure as could be obtained, but that increased the cost and so he tried alloys. The result of adding 5 per cent. cadmium to lead convinced him that it was not necessary to have single pure metals to secure superconductivity. So long as the alloy was the right one, there would be superconductivity, although at a higher temperature than with the single metal. Other problems which had been brought to light by the investigations so far carried out included the fact that when a metal or an alloy was superconducting, its superconductivity was upset if a magnetic field was brought near it. The magnetic field of an electron gave a measure of the work done and certain metals were superconducting at a lower temperature with a.c than with d.c.; also, the superconducting temperature changed with the frequency.

Why should there not be a perfect conductor for heat as for electricity? Was there a proportionality between those two conductivities? There were indications of a structural change inside tin with superconductivity. What was it? He believed it would be found that it related to the free electrons, which had a certain effect just at the transition temperature. Alloys of the precious metals were not superconductors.

Reactive Volt-ampere-hour Meters

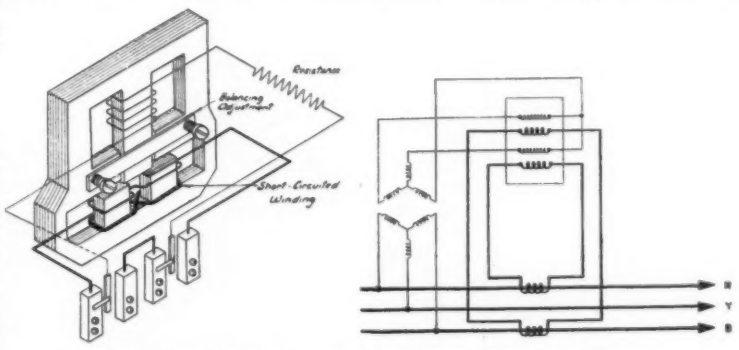
REACTIVE VA-h meters which can be used with standard potential transformers when the neutral point is not available, although subject to comparatively large variations of accuracy with change of frequency, have the advantage of not necessitating a costly special transformer; also the loading is straightforward and thus simplifies the measurement of ratio and phase angle.

A new type of meter described by Mr. G. A. Cheetham before the Meter and Instrument Section of the Institution of Electrical Engineers in London, on March 3rd, considerably reduces the accuracy variation with change of frequency. A simple method of avoiding the difficulties of accurate calibration is also described in detail.

New VA-h Meter

This improved "Metrovick" reactive component meter is similar in appearance to the standard three-phase three-wire watt-hour meter, but it differs fundamentally in the relation of flux in the voltage electromagnets to the impressed voltage and in the method of connection to the circuit. The lag of the flux in each voltage electromagnet is calibrated to 60° instead of 90° in the case of the watt-hour meter. Since the voltage flux lags only 60° behind the impressed voltage, instead of 90° in the case of a standard induction meter, the meter is equivalent in all respects to a standard induction meter connected across voltages leading in phase the actual voltages by 30°. These equivalent voltages lag 90° in phase behind the voltages impressed across the coils of a standard watt-hour meter. The instrument is therefore equivalent to a standard watt-hour meter with the applied voltages retarded 90°, and if the voltages of the system are balanced the meter will register accurately the reactive component of the power under all conditions of unbalanced currents. The conditions of unbalanced voltages are explained and the full mathematical proof of the accuracy of the meter is given in an appendix.

The requisite phase variation has been effected by the addition of a short-circuited winding around the centre of the series system of the meter, as shown, a comparatively small resistance being added in the voltage-coil circuit for fine adjustment purposes only. This method, which is believed to be novel as applied to a reactive component meter, renders the reduction of the time-constant of the voltage circuit unnecessary and results in greater accuracy under conditions of varying frequency. The balancing adjustments consist of movable iron bars which can be adjusted to approach or recede from the poles of the voltage electromagnets, and thus reduce or increase the torque producing flux of either element.



One element of the new meter and diagram of connections

The determination of the errors of reactive VA-h, or sine, meters presents some difficulty, since no corresponding indicating instrument is generally available. The specification of such meters for the grid has, however, rendered it necessary to ascertain their errors with precision.

At the same meeting Mr. R. S. J. Spilsbury, of the National Physical Laboratory, described a direct method of testing and calibrating such meters which consists in the use of a quadrant electro-meter in conjunction with an air cored mutual inductor.

New Methods of Cleaning Coal

THREE coal cleaning processes new to British practice were described at the Institute of Fuel in London by Dr. D. T. Davis on March 8th. None of them is at present in commercial use in this country, but each shows promise. They are the (*a*) Chance sand flotation process, (*b*) Elmore vacuum flotation process, and (*c*) a new air jig developed by Dr. Slater, of the Fuel Research staff. Method (*a*) makes such accurate separation of the coarser material that it is bound to attract attention, while methods (*b*) and (*c*) appear to meet the demand for fine coal treatment by alternative wet and dry methods.

[*Elliott & Fry*

Mr. G. A. Cheetham and Mr. R. S. J. Spilsbury, who dealt with reactive kVA meters at the I.E.E. last week

The Chance Process

The Chance process, though well established in America, has only just appeared in this country as a full scale demonstration plant in the hands of Messrs. Fraser & Chalmers, Erith. The results obtained on British coals to date are remarkably promising. Gravity separation is carried out in a high density mixture of suitably sized fine sand and water. There appears to be some tendency to confuse this type of plant with the upward current type of washer, apparently because a certain amount of agitation water is passed up through the sand bed. Actually the upward currents used are not even great enough to exceed the terminal velocity of the minute grains of sand.

Separation is carried out in a cylindro-conical tank, in which the sand-water mixture is maintained in a fluid condition, partly by agitation water supplied through belts in the lower parts of the cone, and partly by a mechanically driven stirrer.

The Elmore Process

Increasing interest must inevitably be taken in processes capable of cleaning dust prior to utilising this material as pulverised fuel for boiler firing.

The main claims of the Elmore process in comparison with other froth flotation systems may be summarised as follows. Since separation is effected under vacuum and the products then delivered at atmospheric pressure, practically no permanent froth is formed. Coarser material can be handled and particles as large as ¼ in. can be successfully floated. These two factors combine to produce a clean coal which is easily drained and dewatered. The drainage properties of the

clean coal are one of the most striking features of the process; ¼ in. to 0 material can be readily drained to 12 to 16 per cent. moisture, and in this form the coal is almost ideal for handling. No "balling" takes place and the product will run freely through the fingers.

Even in its present stage of development the process will deal completely with a material which practically all other plants find impossible to treat.

The Slater Air Jig

For the dry cleaning of fine coal a bed of the coal to be treated, resting on a pervious support, is acted upon by an alternating current of air supplied from above the bed. At each suction stroke air is drawn through the pervious support, the bed of raw coal is distended and some raw coal is drawn down the inlet pipe into the container until the latter is full to the level of the outlet tube. This tube is permitted to fill and the extraction gears then worked so that the outlet tube is always maintained full of coal and thus sealed. This ensures that on the suction stroke the air passes mainly through the bed of raw coal. Stratification takes place and a bed of dirt forms on the pervious support, and is maintained at the desired height by operating the extractor at the lower end of the dirt off-take pipe.

Electrical Power Engineers Discuss Economisers

THE design and construction of economisers were described in some detail by Mr. R. Pendennis Wallis before the London Technical Group of the ELECTRICAL POWER ENGINEERS ASSOCIATION on February 28th. The aspect that he considered more particularly was the relation of the economiser to the fuel; that is, its effect upon the range of fuels that can be burned in a boiler and the influence upon the economiser of the various constituents of the fuel. For successful operation the tubes must be kept as clean as possible, and the feed water should never be allowed to enter the economiser at a temperature below the dew point of the gases. The inclusion of an economiser in an installation considerably widens the range of fuels it is possible to burn. It relieves the operating engineer of the risk of fusing the stoker links or refractory walls. It reduces the probability of the formation of "cauliflowers" on the grate or of "bird-nesting" in pulverised fuel boilers. But the impurities in the coal have a definite effect on the dew point of the gases and the possibility of corrosion of the external surface of the economiser.

Opening the discussion on the paper Mr. S. A. Lunn said that although in designing a new station it might be advisable to provide for a boiler, economiser, and air heater, if new boiler plant had to be installed at an existing power station, which was not a base load station, and where space was limited, it might be more economical to install the boiler without either an economiser or an air heater, or a boiler and an air heater only. At such a station some of the old plant might be scrapped at the same time and a modern bleeding turbine installed, where the water would be available at a high temperature. He asked if the author advocated corrugating the gills in order to increase the heating surfaces still further. Such tubes would soon become sooted, so that their efficiency would be reduced.

Preventing "Cauliflowering" and Corrosion

Mr. J. Price Walters, discussing the prevention of "cauliflowering," said he believed there were methods of admitting air to a boiler furnace in such a way that the actual combustion was completed in the furnace and not in close proximity to the grate.

Mr. Stuart suggested that if the centre of the tube were streamlined or of the aerofoil type with a fin round it, also of that shape, the surface area would be increased without increasing the resistance very much. Apparently there were materials available which would withstand corrosion attack due to the temperature of the water being below the dew point.

Mr. R. A. Garrett referred to the painting of the internal surface of economiser tubes with "Apexior" before they were put into commission, to minimise corrosion.

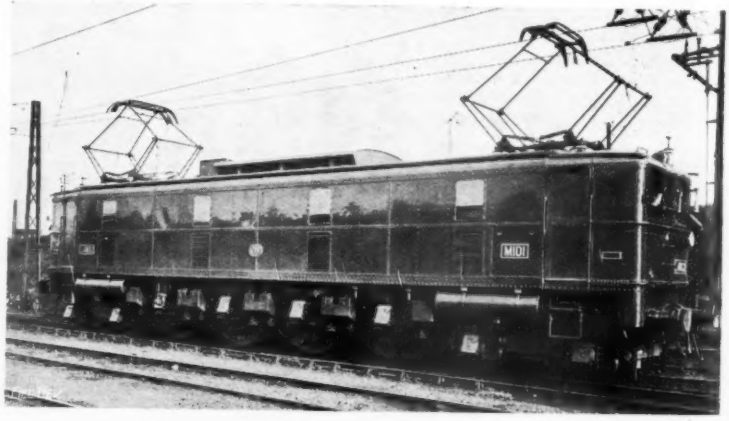
Mr. C. Cooper suggested that soot blowing in accordance with a time schedule was not satisfactory. The best method was to blow in accordance with the temperature rises of the gases across the economiser.

Mr. F. V. Willis said that steaming economisers were used for reducing the cubic contents of boilers for given capacities, and there was the added advantage that the buildings for housing them were not so large as they would be otherwise. The idea was to decrease the boiler size and increase the economiser size. Mr. Kraseman said it was perhaps rather alarming to hear that dew point temperatures were really higher than one imagined them to be in the past. Bearing in mind that many installations had an air heater after the economiser, it would appear that corrosion might be transferred to the air heater, so that one had to maintain the discharge temperature to the air heater.

Mr. Pendennis Wallis, in reply, said that the coldest portion with which the gases came into contact should be at a temperature above dew point. Whether one installed a boiler only depended on the pressure and the extent to which it was proposed to bleed the turbine. Pressures had to be very high before it would pay to bleed three times. With low pressures there might be an odd case where it would be advisable, but generally it was necessary to have a temperature difference of 100 deg. F. in the boiler to make such a practice worth while.

The Arrangement of Gills

With banked fires, and when the economiser was fed with water at a temperature dangerously near the dew point, it was advisable to by-pass during the night. Corrosion would not occur unless the temperature of the water in the economiser was below the dew point of the gases. To increase the scrubbing efficiency of the gas and to keep the film of cooled gas moving a plain surface should be employed. To increase the heat transfer one could pack the gills closely together so that the boundary layer of each gill touched the boundary layer of the next. That was better than using corrugated gills.



One of the new high-speed electric locomotives which have been put into service by the French Midi Railway **(See note on page 361)**

* * *

The Control of Arc Welding

AT the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 27th, Mr. W. P. Digby opened a discussion on "The Control of Arc Welding" by stressing the importance of very careful control and supervision of the welder's operations. He exhibited a number of slides illustrating defective welds and described their causes and the necessary precautions for their prevention.

The standard set by Mr. Digby was perhaps unusually high and his criticisms were mainly with reference to welding for pressure vessels, fluid or gas, at ordinary atmospheric temperatures and for ordinary structural work. With regard to electrodes, he said that a B.S. Specification which was overdue should define permissible composition which should vary as the composition of the steel varied. It should deal with the rate of deposition, the control of thermal stresses likely to be set up, and even the limits to the increased corrosion which followed welding.

Mr. C. W. Hill said that arc welding was the poor relation of the electrical industry and not enough was being done to foster it. There was very little literature or recorded information to give structural engineers the confidence in electric welding that it deserved. Major J. Caldwell said that heavily coated electrodes were growing rapidly in favour in the United States where cases of hand welding using currents up to 600 or even 700 A had occurred. He described outstanding successes of welding in shipbuilding at home and abroad, also, notably, some large gasholders in Australia.

Sound Recording

At a meeting of the PHYSICAL SOCIETY in London on March 3rd in the lecture theatre of the Western Electric Co., Ltd., an artificial larynx was demonstrated by Major Gerald Jacques, after which cinematograph films concerned with sound recording and allied subjects were shown.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A Sales Development Association

The reference in the article appearing under my name in your issue of February 24th to the effect that E.D.A. is fully capable of undertaking all the propaganda work necessary to secure the development of electricity, was in regard to the suggested formation of another association entitled as above.

I fully realise that E.D.A.'s funds should be considerably augmented and that if necessary it should be revitalised, but do not let us have yet another organisation. Strengthen E.D.A. without delay!

J. W. SIMPSON,
Secretary,
Incorporated Municipal Elecl. Assn.

London, W.C.2,
March 3rd.

Though a humble member of the industry I am taking this opportunity of heartily endorsing the view of a prominent member to the effect that there is a great need for a Sales Development Association. Also I consider that the majority of the members of such an organisation should be drawn from the ranks of the " sales " side of the industry, *i.e.*, sales managers, showroom superintendents and assistants, consumers' engineers, sales engineers, &c. This would give the chief persons concerned an opportunity of expressing their views on such subjects as advertising, window dressing, sales management and development, and so gain knowledge from each other's experiences and ideas.

I suggest that window dressing and sales competitions should be held each month. Sales demonstrations could also be given by different members, and a special standard set for all sales employés.

I feel confident that it is only a matter of time before a Sales Development Association is inaugurated. A. C. HAZEL.

Plymouth, *March 4th.*

A Miniature Power Station

I enclose a photograph (reproduced herewith) of the power station at Tichwell, a small village on the coast road from Hunstanton to Wells in Norfolk, which is reputed to be the smallest in England. The fifty or so cottages in the village are supplied from a small generator driven by a Petter oil engine, and banks of accumulators. The chief engineer is also the

The Tichwell power station

slot meter collector and if any repairs have to be done he is the man called in to attend to them.

Trouble has recently arisen because the accumulators are fast wearing out, and if the station is to continue a new set will have to be installed. All the while, a few fields away, high-voltage transmission lines can be seen linking the neighbouring villages to the grid. W. C. ROWSELL.

London, N.15, *February 28th.*

Indifference

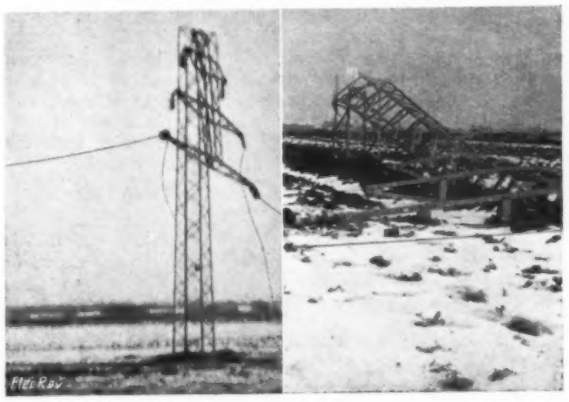
In his article bearing this heading in your issue of January 27th, the General Secretary of the trade union catering for the staffs of the electricity supply industry refers to the case of a member being expelled for accepting a post at a few pounds per year less than the stipulated figure. This parrot-like reiteration of a specific instance is in glaring contrast to the oyster-mouthed attitude adopted when a member who does not apply for these so-called low-paid jobs, and remains unemployed in consequence, is expelled for arrears of subscription.

Perhaps Mr. Jones during his propaganda campaign on behalf of trade unionism will kindly explain this anomaly or, better still, try to convince the would-be dictators that consistency in principle is one of the elementary laws of common decency. If these people were half as energetic in promoting the welfare of the industry which provides soft well-paid jobs for the favoured few as they are in making and enforcing pettifogging trade union rules and regulations there would be less room for such exposures as those recently appearing in the lay Press. SCRIBE.

March 3rd.

Shock Protection

The leakage system referred to by Mr. S. H. Parsonage and Mr. T. C. Gilbert is evidently one where the metalwork to be protected is not bonded solid to earth, but is earthed through



The effect of wind and snow on the 38-kV line of the Irish Free State Electricity Supply Board supplying the Milltown section of Dublin

a high-resistance trip coil operating a relatively delicate relay. It is claimed that this trip will operate with a potential difference of as low as 20 V. It does not follow, however, that the potential will be *limited* to 20 V; it merely means that the relay will operate with 20 V *or more* across the coil. Should, therefore, a fault be such that a dangerous potential is likely to arise, this will take place and a dangerous, perhaps fatal, shock will occur before the circuit is opened. For example, if, at the time of a dead fault to metalwork, a person is in contact with it, the metalwork will immediately be raised to full line potential above earth (owing to the high resistance of the trip coil) and will remain so until the coil has been energised, the trip mechanism operated, and the breaker cleared. If this is correct the device is of little practical value; in fact, as it will give a false sense of security, it is more a danger than a safeguard.

The most effective shock prevention is (*a*) to insulate where you can, and *insulate well*; (*b*) to earth where you cannot insulate, and *earth properly*; (*c*) to have a well-planned installation with a minimum of complicated gadgets; with (*d*) the best and surest materials and workmanship; and (*e*) regular inspection and maintenance. There is little that will not suffer from lack of regular inspection and maintenance, not even shock-prevention devices. A. E. GASTER.

Hendon, N.W.4, *March 3rd.*

Peaks and Charges

Your issue of February 17th contains two letters of importance and interest to the industry. Mr. J. N. Perks rightly points out that hitherto we have regarded the domestic load as an off-peak load. He states that the domestic load, as it increases, will constitute the system peak and that even now a proportion of the domestic load merges in the system peak, dependent upon diversity between that load and the existing peak, and he refers to the absence of reliable figures for diversity in this country.

Can the diversity factor be correctly ascertained? If the maximum load is taken at a sub-station, unless the individual maximum demands of the consumers are known, there is no diversity factor apparent. If all sub-station maximum demands on the system were taken and compared with the peak load, the diversity factor would only be an approximation and not the sum of individual consumers' maximum loads divided by the maximum load upon the system during the particular period under review. Having regard to the fact that

any consumer may have a good diversity factor during the period in question it does not follow that this diversity factor is maintained during another period. If the diversity factor could be ascertained in what manner would the correct application of this factor be made use of?

Take the case of a group of consumers (shops, licensed houses and hotels) whose individual maximum demands all come on at peak load, which occurs at about 5 p.m., a few days before the Christmas holidays. The undertaking pays for kilowatts on this peak load; accounts to consumers are made out quarterly and it was found that the undertaking was paying for more kilowatts than it charged for owing to the fluctuation of the maximum demands during the summer quarters. This, of course, could have been rectified by reconciliation on the last account of the year, but consumers would not appreciate any addition to the charges on the last quarter's account.

With regard to Mr. Bullen's letter relating to the varying times of maximum demand, I emphatically agree with what he states, that under a two-part tariff with the rates now being offered by the Central Board, domestic cooking will not only be retarded but prohibited. If at the present time we pass on to the consumer the Board's tariff with the addition of even a small charge for profit, the kW charge for a family cooker with a demand of 5 kW would be in the region of anything from £15 to £20 per annum plus the kWh charge. If we take into consideration distribution, administration, interest, and sinking fund charges, the figure would be absurd.

How would the introduction of a three-part tariff meet the case, and if so, in what proportion would it be applied?

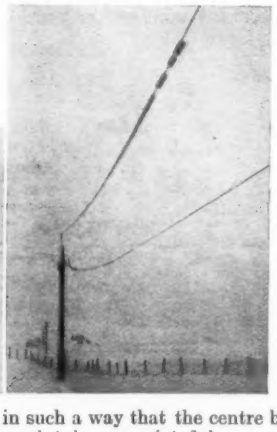
February 27th. KILOWATTS SENT OUT.

There is one flaw in Mr. Humphrys' argument, and that is that the supply undertaking is not penalised to the extent of the total cooking demand but only by the additional peak, which in my experience would be something less than ½ kW per cooker.

Quoting from the records of my own undertaking the maximum cooking load is from 1,400 to 1,500 kW, but the value of the peak, which is over and above the peak at other times, is nearer 500 kW. In the case of the storage cooker, this would amount to something over 600 kW for the same number of cookers on circuit and would be definitely additional to the peak at whatever time it occurred.

A. BULLEN,
Engineer and Manager,
Welwyn, *March 4th.* Welwyn Garden City E.S. Co., Ltd.

The recent blizzard imposed a tremendous burden on this 11-kW transmission line between New Galloway and Newton Stewart. In some parts the snow coating had a diameter of four inches. The right-hand picture shows the effect upon a pole



Slide Rule Decimal Points

Referring to the letter from Mr. A. E. Robinson of Brussels, in your issue of February 17th, I would say that the method described is similar to that which I have myself carried out for some years, except that I determine, by inspection, the characteristic of the logarithm of the answer, *before* I begin operations on the slide rule. I think Mr. Robinson would find this much simpler and quicker.

B. C. VAUGHAN,
Chief Clerk, Corporation Electricity Dept.
Southampton, *March 3rd.*

Distribution and the Small Undertaking

As a strong supporter of a new governing body to deal with distribution may I express my disapproval of Mr. Blake's letter. I think his criticism of those who know their job is not sufficient to condemn the proposals. Many condemned the grid who thought they knew their job; even though business and financial conditions have altered since 1926 I am confident that the grid will survive its critics.

A few prominent undertakings are then mentioned by Mr. Blake. If their peak is changing to 8 a.m. they would have had to put in plant at a higher cost than the grid price of £3 per kW, allowing for extra management costs, rates, &c. One or two engineers have shown us how to sprint on distribution even with the handicap of a generating station; their record would have been much higher had they been free from this handicap.

Later on Mr. Blake mentions that two separate undertakings having 20 per cent. l.f., may have a combined load factor of 33 per cent. Mr. Blake uses too many "ifs" and "mays"—let the two concerns combine and get cheaper electricity. The C.E.B. would be glad to have the responsibility of an extra point of supply removed.

I am confident that the Board has mathematically calculated its prices, and I trust a straight equitable cost basis is aimed at. The Board can get off-peak electricity dirt cheap: I am looking forward to some of this at less than 0.18d. per kWh, and I am cultivating my ground in anticipation and in the hope that no one will be able to persuade the Board to penalise my high load factor for the benefit of a lighting undertaking to enable it to reduce a lighting rate of 5d. per kWh to 4½d. per kWh (5d. is already too low). I believe curve "A" more helpful than curve "B," and I am willing to be sent to the place indicated by Mr. Blake.

W. A. TURNBULL, M.Inst.C.E., M.I.E.E.,
Borough Electrical Engineer and Manager.
Aylesbury, *March 6th.*

Distortion of Hotplates

The suggestion that there is a tendency for enclosed-type hotplates to distort, as quoted in your notes on "Domestic Cooking and Heating" on February 24th must not be seriously considered in the light of practical experience. So far as cast-iron is concerned distortion may result from two causes: first, the use of an iron of unsuitable composition which will "grow" as a result of chemical changes taking place at temperatures reached in service; and, secondly, the use of unannealed castings. Provided, however, that iron of suitable composition is used, and that the casting stresses are relieved by annealing at a temperature higher than that which will be attained in use (the castings subsequently being machined flat), no appreciable distortion will occur during life. Quite apart from the conclusions arising out of the most exhaustive laboratory tests, this has been proved to the satisfaction of the majority of supply engineers who between them have in regular service on their mains considerably more than 150,000 cast-iron topped hotplates of the type under consideration, which have been made in this country during the past four years.

It is admitted that distortion may also be produced by mounting the hotplates in cookers in such a way that the centre bolt is unduly restrained, but this point is appreciated by most cooker makers who arrange their hotplate mountings accordingly. Provided that the necessary precautions are taken to eliminate distortion due to heat, cast-iron is an eminently suitable material to use for the tops of enclosed-type hotplates for the following reasons:—

1.—It is very robust and is not subject to mechanical distortion as a result of rough usage.

2.—The rough "as cast" surface on the underside of the casting provides an excellent key for the refractory cement used to embed the resistor coils, and thus ensures freedom from air gaps between refractory and top plate which would result in high wire temperature and consequently short life.

3.—The fins of iron, which form the grooves in the casting, collect the heat from the underside of the coils and conduct it to the top of the casting, thereby reducing the thermal resistance through which the heat has to travel and permitting of lower wire temperature.

4.—With a grooved cast-iron top a greater length of wire can be accommodated than is possible with other types of construction and consequently wire diameter is increased. This again permits of a lower wire temperature for any given loading.

5.—As a result of the factors outlined above the temperature gradient between wire and hotplate top, for a given energy output, is lower in the case of a cast-iron top than in the case of other types of construction. It follows that higher loadings can be obtained while still maintaining sufficiently low wire temperature to ensure long life, and boiling times are correspondingly reduced.

The engineers of supply undertakings who already have thousands of cast-iron enclosed-type hotplates in service on their mains will agree that failures or cases of bad service arising out of distortion are negligible, and insufficient to justify a change in the type of plates fitted to their cookers.

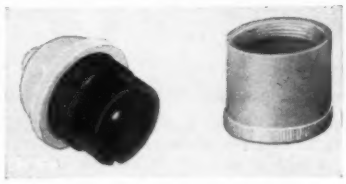
London, W.C.2, *March 7th.* D. G. W. ACWORTH.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Ivory "Bakelite" Components

MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, inform us that they are now making their full range of "Bakelite" components in "Ivorant" moulded white. Our illustration shows a new "Ivorant" shade carrier cord grip holder; both the shade carrier and cord grip can be unscrewed from the brown "Bakelite" body.



A new "Goltone" product

Industrial Lighting Fittings

Several new industrial fittings are now available from the ENGINEERING & LIGHTING EQUIPMENT CO., LTD., Sphere Works, St. Albans. The "S.L.R.," made in sizes of 14, 16, 18 and 20 in. in diameter, has a cast-iron top which is easily detachable for wiring but is completely waterproof. The reflector is vitreous enamelled and plate glass in which wire mesh is embedded is used. The 14-in. model (for 100-150 W lamps) costs £1 16s. 3d., while the 20-in. type (for 1,000-1,500 W lamps) is priced at £3 0s. 9d. Another type of "S.L.R." fitting for 40, 60 and 100 W gasfilled lamps is available at 5s. 6d., 6s. 6d., and 9s. respectively.

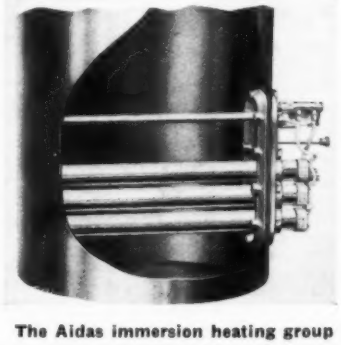
The "Pinnacle," selling at £1 12s. 6d., is a new directional lighting fitting suitable for lamps of 100 and 150 W, while a new prismatic bulkhead fitting, priced at £1 4s., has a standard tapping ¾ in. top entry, the lid being rendered water and vapour tight by a special rubber gasket. The glass is smooth on the outside and is claimed to be sufficiently strong not to need a guard.

New E.L.E.C. industrial lighting fittings

The "Aidas" Immersion Heating Group

The development of water heating by electricity has been due largely to the automatically controlled thermal storage heater; the disadvantage of this system, however, is the initial cost of the installation, and it is to overcome this drawback that the "Aidas" immersion heating group has been designed. It can be fitted to existing tanks without soldering, and with a 1,500-W loading costs only £3 10s.

The elements are the same as those used in the "Sadia" automatically controlled thermal storage heaters, and are obtainable loaded at 1,000 W (12 in. long), 1,500 W (12 in.), 2,000 W (15 in.), or 3,000 W (22 in.). The flange and counter flange are of tinned gunmetal, and the element and thermostat tubes are of tinned copper. The terminals and mercury switch are enclosed by a nickel-plated brass cover. Two special gaskets and ten ⅜-in. fixing bolts are also supplied, and a group can be fitted equally well to cylinders as to flat tanks.



The Aidas immersion heating group

If a loading of more than 3,000 W is desired, one group can be fitted at the bottom of the cylinder and one in the middle—in this way a good balance can be obtained because the top thermostat will operate before the lower one. The largest size, type "HG3" has two mercury tubes on the thermostat and costs £4 15s., while the small model (HG1") can, if necessary, be made for lower loadings than 1,000 W and costs £3 10s. The 2,000-W model costs £4 and is known as type "HG2." To facilitate fixing a special tool kit is available for 7s. 6d. from the manufacturers, AIDAS ELECTRIC, LTD., Aidas Works, St. Leonard's Road, Willesden Junction, N.W.10.

An Improved Overhead-line Switch-fuse

The 11,000-V overhead-line switch-fuse introduced by MESSRS. GEORGE ELLISON, LTD., Perry Barr, Birmingham, some twelve months ago has now been improved in various details. It is operated by a pair of steel-wire ropes passing over sheaves at the top and attached to winding gear at the base of the pole, so that a man can wind the fuse carriers down to his own height for inspection or renewal of the fuses.

The two winding drums are arranged to be extensible to accommodate sufficient wire rope for the switch to be mounted 45 ft. above the winding gear. Special pole clamps, which have been designed to be adjustable for varying pole diameters, grip the poles securely without drilling. Adjustments are provided on the framework of both the winding gear and switch machines, so that the centres between the H-pole may be any distance up to 6 ft. A new shape of fuse carrier insulator, having spark-over characteristics representing a 60 per cent. improvement on B.S.S. requirements, is fitted. The centre of the insulator is hollow and can accommodate any one of three makes of cartridge fuses.

Ellison overhead-line switch-fuse; fuse carriers being lowered

Electrically Driven Centrifuge

An improved type of electrically driven centrifuge of the over-driven type is being marketed by MESSRS. THOMAS BROADBENT AND SONS, LTD., Central Iron Works, Huddersfield. The basket has a central bottom discharge to permit the centrifuged material to be dropped out below the machine.

For a.c. supply the motor is of special design, and is constructed to give very rapid and smooth acceleration, and is direct coupled by means of a spline coupling without clutch. The machine is very quickly raised to full speed, and, consequently, gives considerably increased output.

For d.c. supply a heavy-duty traction-type motor is used, coupled by means of an automatic clutch. The special method of mounting the motor considerably reduces oscillation of the basket during the accelerating period. The frame is built of substantial rolled steel sections, braced together with steel gussets and cleats. Centrifuges which have the monitor case raised above the floor level are fitted with a working platform integral with the frame.

The basket and spindle are supported by a combination of large-size ball and roller bearings carried in a special housing, and seated within a conical rubber buffer bearing of correct flexibility. This form of bearing requires no attention whatever beyond occasional grease lubrication. The basket spindle is of large diameter, and made from special mild steel, while the

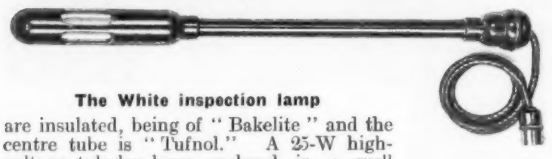
The Broadbent a.c. centrifuge

basket is constructed from the metal or alloy as specified, fabricated to give an exceptionally high factor of safety, and perforated according to requirements. The shell is made of increased thickness to eliminate strengthening hoops, which often give a false impression of safety. The basket is supplied to suit the customer's requirements. If necessary, it can be increased in depth to give greater capacity, and it can be lined with any class of metal gauze lining, screen, or filter cloth.

A wall-mounted, hand-operated starter is fitted with no-volt and overload releases. Push-button control is supplied if specified. The brake is of the quick-acting, spring applied, self-locking, adjustable-band type, lined with "Ferodo," and acts upon a large diameter brake pulley keyed on to the spindle.

A Corrosion-proof Barrel Inspection Lamp

MESSRS. J. C. WHITE & CO., LTD., 49, Bridge Street, Deansgate, Manchester, have just started marketing a new corrosion-proof barrel inspection lamp. The top and bottom sections



The White inspection lamp

are insulated, being of "Bakelite" and the centre tube is "Tufnol." A 25-W high-voltage tubular lamp enclosed in a well glass is used, and moisture and fumes are excluded from the metal parts of the lamp-holder. A special c.t.s. grip is incorporated and a rubber washer prevents any moisture getting through the cable entry. All parts are non-hygroscopic and heat resisting. The price is 17s. 6d.

A Wall-mounted Battery Charger

The new "Westric" home-garage battery charger, a product of the WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, N.1, includes a metal rectifier and a special transformer. Chargers are available for 6-V and 12-V batteries at 75s.

The charger is fixed to the wall of the garage on the driver's side, a flexible lead being taken to the socket on the dashboard. The current can be switched on and the car battery left on charge all night. The charger is suitable for a.c. mains only, and both 240/250 and 100/120-V models are obtainable. A fuse protects the charger against short-circuits or use on a wrong voltage.

The "Westric" battery charger

The "Nitraphot" portable floodlight

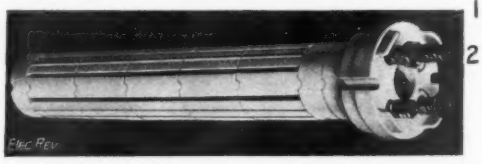
A Portable Floodlight

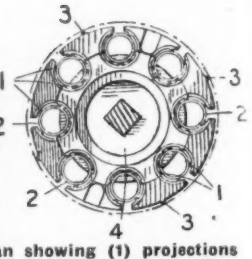
A special portable floodlight for photography is being marketed by MESSRS. SANDS, HUNTER & CO., LTD., 37, Bedford Street, Strand, W.C.2. It can be obtained in a case containing two reflectors, with special "Nitraphot" lamps and two nickel-plated tripods for £9 12s. The 500 W "Nitraphot" lamp costs 23s. 6d., and, it is claimed, gives a soft yet intense light, which is necessary if good photographs are to be obtained.

A Vertical Water-heater Element

To prevent the spiral closing up at the bottom under gravity and also to overcome condensation troubles inside the case, BERRY'S ELECTRIC, LTD., 85-86, Newman Street, W.1, have introduced, and are now using in all their water heaters, a new type of vertical element.

On the outside of the insulating former small projections hold it in spaced relation to the inside of the metal case, while similar projections in the bores containing the resistance hold





A vertical water-heater element, with sectional plan showing (1) projections in former bore; (2) spiral; (3) projections on former; (4) sectionalising discs

the spirals in spaced relation to the faces of the passages. The value of these projections lies in the fact that leakage currents are compelled to take paths of very high resistance both from the spirals to the former and from the former to the metal case. Prevention against sagging is obtained by the employment of discs between the 2-in. sections of the insulator. The discs engage between the coils of the spiral, so that each section of the latter is held in its correct relation to the other sections.

A Portable Electric Groomer

A portable electric groomer and cleaner for horses, cattle, etc., is a recent introduction of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. It is, in effect, a specially designed vacuum cleaner, the major portion of which is strapped to the back of the operator. Reinforced-rubber hose connects the machine proper, and the special grooming head carried in the operator's hand. A control switch and 6 yds. of 3-core tough rubber sheathed flexible lead are provided.

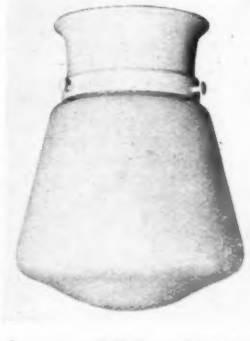
The "Magnet" groomer and cleaner

By means of special attachments and extension pieces the groomer can be converted into a general suction cleaner and used for cleaning operations in and around buildings, for the upholstery of motor cars, and other purposes. A special attachment converts the cleaner into a blower for cleaning out electrical machinery and removing dirt from otherwise inaccessible positions. The outfit, complete with a special grooming head, costs £12 13s. 6d.

A Self-priming Centrifugal Pump

MESSRS. DRYSDALE & CO., LTD., Yoker, Glasgow, have put on the market a novel design of centrifugal pump.

The "Wee-Mac" pump works on a new principle; the impeller is a plain disc with a number of blades arranged round the periphery, and rotates inside a concentric casing having a wedge-shaped passage on each side of the impeller. The passage on one side gradually decreases in area from the suction opening where it is a maximum; on the other side an opposite handed passage gradually widens until the discharge opening is reached. The water circulates in each of the blades itself where it is given an impulse. The discharge into the pipe passages is taken up by the next cell and so on until the discharge orifice is reached. This compound pumping effect enables the pump to deliver at approximately three times the pressure of an ordinary centrifugal pump of the same proportions.



A new G.E.C. white-enamelled bathroom or kitchen fitting, with 6-in. opal glass globe. Price 7s. 6d.

It is claimed that the "Wee-Mac" pump can not only fill an empty suction pipe but can deal with air-locks due to loops or rising in the suction pipes without the slightest difficulty. Tests have proved the pump capable of working with a suction lift of 28 ft. It is made in various sizes, from 120 to 3,000 gal. p.h., and for pressures up to 150 lb. per sq. in., equivalent to 346 ft. head.

The Japanese Lamp Industry

THE remarkable development of the electric lamp manufacturing industry in Japan was recently described in a Far Eastern contemporary. The following is a summary of the principal points.

The production of the Japanese incandescent lamp factories has increased in recent years at the rate of between twenty and thirty per cent. yearly. The advance is attributed partly to the growing demand in the home market and partly to the expiry of important lamp patents. According to statistics published by the Japanese Ministry of Commerce the output of incandescent lamps has increased as follows since 1923 :—

	Millions.	Value in Million yen.
1923	45.7	16.3
1924	55.1	17.3
1925	57.1	17.1
1926	63.6	15.2
1927	87.3	26.3
1928	97.5	24.3
1929	134.2	17.7
1930	114.8	15

Thus in five years the output was doubled, while the average price was halved.

An even greater upward movement was shown by the export trade in lamps. The statistics of the Ministry of Finance show this to have been :—

	Millions.	Value in Million yen.
1926	30.4	3
1927	40.2	3.2
1928	66.3	4.5
1929	96.8	5.3
1930	101.6	5.3
1931	151.5	5.9
1932 (Jan. to Oct.) ...	211.1	7.78

The chief cause of the advance in the export trade is the low price of the Japanese lamp, coupled with the depreciation of the yen. For this reason Japan has been able to compete easily in South Africa, Brazil, Java, Sumatra, &c., with established Western makes. The United States is said to be the most important market for the Japanese lamp.

The manufacturers changed over in 1929 from the carbon filament to the metal filament, and as a result Japan advanced to first place as an exporter to the American market, where formerly she had stood fifth, after Germany, Austria, Belgium, and Holland. It is estimated that about 30 per cent. of the requirements of the American market are supplied from abroad and that two-thirds of the imported lamps are supplied by Japan. Other important outlets for Japanese lamps are: Sumatra (1931, 176,700, against 67,906 from Holland); Malay Peninsula (1931: 691,174, against 147,540 from Great Britain and 147,038 from the United States), the Philippines, Siam, and South Africa. Exports of Japanese lamps to all these markets reached record figures in 1932.

Production Costs

There has been an agitation in the United States for a dumping duty on Japanese lamps, the allegation being made that the price of Christmas tree lamps in Japan was 50 cents to 70 cents (2s. 1d. to 2s. 11d. at par) per 100, while they were being sold in the United States at 40 cents (1s. 8d.), duty unpaid, and that lamps for house lighting (60 to 100 W) were priced at 4.85 cents (2¼d.), while being offered in the United States at 4.38 cents (2¼d.).

Against these allegations the Lamp Export Guild of Tokyo has submitted the following interesting data: Costs per 100 of Japanese Christmas tree lamps: (1) raw material, 83 sen (glass 48 sen, metal 20 sen, wire 6 sen, remainder 9 sen). (2) Labour, 77 sen. (3) Profit, 20 sen. Total, 1.80 yen (f.o.b. Yokohama).

The production costs of standard export incandescent lamps, transparent, vacuum, 120 V, 20 to 60 W, per hundred is given as follows :—

Bulb	1.20	On cost	0.16
Filling	0.65	Wages	0.70
Metal cap	0.60	Packing	0.58
Glass tube and filament... ...	0.64	Transport	0.05
Armature	0.11	General expenses	0.23
Waste and breakage	0.09	Profit	0.50
Heating and power	0.27		
		F.o.b. Yokohama ...	5.78 yen

With the yen at par (2s.) this gives a figure of less than 12s. per 100. With the yen at its present exchange value of 1s. 2¼d. the figure falls to about 7s.

There are now 131 lamp factories in Japan, of which 113 employ from five to fifty workpeople, nine between fifty and 100, three between 100 and 200, and three over 200.

Electricity Supply in Roumania

THE Association of Producers and Distributors of Electrical Energy in Roumania, generally known as the A.P.D.E., was founded in Bucharest in 1931 under the presidency of Prof. Stefanescu-Radu, director of the Bucharest Electricity Works. For the purposes of the Association the country has been divided into four sections, with regional headquarters at Câmpina, Hermannstadt-Sibiu, Temesvar-Timisoara and Jasi respectively. In addition to the interchange of technical and economic information, the Association devotes itself to laws and regulations bearing on electricity, and to the compilation of electricity supply statistics.

The returns for the year 1931, says H. Thiess in *Elektrotechnische Zeitschrift*, include data relating to 168 public supply stations, totalling 204,500 kW capacity, of which 173,600 kW, or 84.9 per cent., is in seventy-eight three-phase stations, and 25,800 kW, or 12.6 per cent., in eighty-seven d.c. stations. Numerically the d.c. plants are still predominant, but by far the greater part (84.9 per cent.) of the total plant capacity is already three-phase, and this proportion will increase with the further growth of overland stations and networks. Of the total 59.2 per cent. was in eighty-nine steam sets (average capacity 1,220 kW), 25.4 per cent. in 283 Diesel sets (average 183 kW), 14.2 per cent. in sixty-five hydro-electric sets (average 446 kW), and 1.2 per cent. in gas and petrol sets (average 83 kW). The Diesel sets include a 5,000-h.p. Diesel set at Bucharest and a 3,300-h.p. unit at Hermannstadt.

Hydro-electric Production

Water power development is relatively unimportant, but some progress has been made during recent years, and the Dobresti plant on the River Jalamita (Sinaia) has a capacity of 16,000 kW. The annual load factor of the hydro-electric plant was comparatively high in 1931, *viz.*, 31.4 per cent., compared with 17.3 per cent. for the gas and petrol plants, 15.4 per cent. for the oil plants, and 15 per cent. for the steam plants. These figures correspond to a total annual production of 311,800,000 kWh in 1931, of which 50.9 per cent. was derived from steam, 25.4 per cent. from water, 22.5 per cent. from oil, and 1.2 per cent. from gas and petrol.

Whereas public supply stations of 204,500 kW total capacity supplied 311,800,000 kWh in 1931 (mean utilisation 1,520 hours per annum), private plants aggregating 130,500 kW capacity supplied 208,200,000 kWh (mean utilisation 1,600 hours per annum). Taking public and private plants together, the capacity and output for the years 1929-31 were :—

Year	Total generator capacity. kW.	Total output. kWh.	Mean hours of use of plant per annum.
1931	335,000	520,000,000	1,550
1930	304,000	550,000,000	1,780
1929	290,000	570,000,000	1,970

The output of the public supply stations, in million kWh, rose from 290 in 1929, to 304 in 1930, and 311.8 in 1931, but that of private plants fell from 280 in 1929, to 246 in 1930, and to 208.2 in 1931.

At the end of 1931 there were in service about 250 miles of 60- and 110-kV transmission lines, and about 690 miles of lines at from 3,000 to 25,000 V. The original statistics show the supply conditions in 373 places. The average price to consumers was about 4½d. per kWh (taking 40 lei=1 shilling), compared with 6¼d. in 1914. The total sum invested in the public supply stations up to the end of 1931 was about £7,500,000. The output of these stations in 1931 averaged 17.3 kWh per head of total population.

British Technical Training for Chinese Students

THE Chinese Industrial Mission which is visiting this country has promised its support for a scheme which has been formulated whereby Chinese students can receive technical training in Great Britain. For many years past isolated arrangements have been made by a few British engineering manufacturers to provide training in their works for one or more Chinese students as a means of developing future business with China. An opportunity for the systematic development of training facilities in this country was provided by the China Indemnity (Application) Act, 1931, which authorised the use of a portion of the remitted Boxer Indemnity Funds for purposes connected with the education of Chinese students. Accordingly a joint committee of the China Association and the Federation of British Industries was set up at the end of last year to formulate a scheme whereby British industry might obtain the maximum advantage to be derived from the education of Chinese students under British influence. This scheme has resulted in the Federation's securing a grant from the funds for the purpose of defraying expenses connected with the technical training of Chinese students in the United Kingdom, and arrangements are now being made by the Federation for the placing of students in engineering works in this country.

In the Courts

IN the King's Bench Division on March 2nd Mr. Justice Goddard had before him a dispute arising out of the change-over by the Chester Corporation Electricity undertaking from d.c. to a.c. It was stated by Counsel that the decision affected every electrical undertaking in the country.

The question was raised by way of a special case stated by an arbitrator. Mr. Bertram Lakeman, an electrical engineer and contractor of Chester, claimed from the Corporation compensation in respect of battery-charging apparatus which he alleged had been rendered useless by the change-over. The arbitrator to whom the dispute was referred found that the apparatus used by Mr. Lakeman constituted "existing apparatus" within the meaning of the Consent Order to the change-over made by the Electricity Commissioners, and that the alteration of the system of supply had rendered the apparatus useless for the purpose of battery charging. The Consent Order was subject to the condition that "unless otherwise agreed the undertakers shall at their own expense carry out the necessary alterations to consumers' existing apparatus to suit the altered system . . . or pay to the consumer injuriously affected by the alteration of the system such a sum as may be agreed upon or in default of agreement as may be determined by an arbitrator."

The Corporation contended that it was only liable to pay Mr. Lakeman £2—the scrap value of his apparatus—whereas Mr. Lakeman claimed that he was entitled to be paid £41 17s. 4d., the cost of a new plant suited to the altered system.

In giving judgment his Lordship said that it was not disputed that Mr. Lakeman's business had been seriously affected by the alteration of the system of supply. He thought that the award of the arbitrator in favour of Mr. Lakeman for £41 17s. 4d. was right and should be upheld. Judgment was entered accordingly.

A Welding Patent Dispute

In the Chancery Division on March 3rd an action brought by Murex Welding Processes, Ltd., against Weldrics (1922), Ltd., came before Mr. Justice Farwell, an action for an injunction to restrain the defendants from infringing the plaintiffs' letters patent No. 127315 granted to Mr. E. Jones in 1917 for improvements relating to electrodes for electric arc soldering, and for ancillary relief, *viz.*, damages and delivery up of the alleged infringing articles.

Mr. Moritz, K.C., for the plaintiffs, explained that the plaintiff company was formerly known as the Alloy Welding Process, Ltd. The defendant company came into evidence in 1922 and was really an amalgamation of two other companies. The infringement complained of was the manufacture and selling by the defendants of electrodes made substantially in accordance with the plaintiffs' specification. The defendants denied infringement, and pleaded that the plaintiffs' patent was invalid as lacking novelty and by reason of two alleged prior users. There was also a plea of inutility, want of subject matter, and that the plaintiffs' alleged invention had been anticipated by eight British publications as well as a German one.

Mr. Moritz said that in electric arc welding the material used for the slag was all-important and it was necessary to choose metals which would alloy themselves. The plaintiffs' case was that the defendants had infringed their invention of an extrusion process in which the wire was wound with asbestos yarn or other suitable non-conducting material in open spirals.

Mr. G. Baillie, consulting engineer, gave evidence for the plaintiffs, explaining the nature and utility of their invention. He said that the nature of the invention as described in the specification was wrapping an open spiral round the wire to keep it central in the extrusion die. There were also other advantages. Prior to this invention the method in use for providing a slag coating for an electrode was dipping the wire with a fluid solution, which was unsatisfactory. He did not agree that extrusion was merely another way of covering the rod.

The re-examination of the witness was postponed to enable him to make certain experiments before being recalled as a witness. Dr. J. H. Paterson, managing director of the plaintiff company, also gave evidence.

At the conclusion of the plaintiffs' case Mr. Whitehead, in opening the case for the defence, contended that it was clear that prior to the date of Mr. Jones's specification numerous materials had been used for casting electrodes. Mr. Jones did not claim that he was the inventor of any special extrusion machines. He submitted that the plaintiffs' specification was plainly bad for insufficiency and for ambiguity. If his Lordship came to the conclusion that the claim was for an extrusion process then he submitted that claims 1 and 4 of the plaintiffs' specification had been entirely anticipated and that claim 3 was bad for want of subject matter. Apart from the question of anticipation he contended that the plaintiffs' patent was invalid for want of subject matter. In the circumstances there had been no infringement by the defendants.

Mr. H. A. Gill, consulting engineer, gave evidence for the defendants, and the hearing was adjourned.

Alleged Trade-mark Infringement

In the Chancery Division on March 3rd Mr. Justice Luxmoore had before him a motion by the Emkabe Radio Co., Ltd., against Werners Radio, Ltd., to restrain until the trial of the action the alleged infringement of the plaintiff's trade mark "Astra" by defendants.

Sir Stafford Cripps, K.C., for the plaintiffs, said that the word was used in connection with the sale of radio-telephone apparatus, and it had been agreed to treat the motion as the trial of the action. There would be an injunction in the terms of the notice of motion with an inquiry as to damages, in default of agreement, and costs.

Mr. Whitehead, K.C., for the defendants, consented and his Lordship made an order accordingly.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

ON March 2nd the London Passenger Transport Bill was read a second time in the House of Lords. A motion to refer the Bill to a Select Committee in respect of its financial provisions was negatived by 155 votes to 13.

During the debate an important speech was made by Lord Ashfield, the chairman of the Underground Group. He strongly supported the Bill, and, in the course of his remarks, suggested that in future a scheme should be projected for the gradual electrification of the suburban lines of the main line railways, and for building, as was found necessary, a completely new underground railway extending from some point in the western part of London and projecting straight through to somewhere in the neighbourhood of Ilford.

The solution lay in the construction of high-speed lines which would serve as feeders to the local lines. All these things would involve very large sums of money. So long as the present situation continued there was no prospect of any further extensions or improvements to the Underground system and no possibility of any extensive scheme of electrification of the suburban lines of the main line railways. It was only by complete fusion of all the interests concerned in the London traffic area, by establishing a common management which would have a common policy directed to the proper, orderly development of this great system of transport, that it would be found possible to provide the facilities which the public wanted.

Electricity Orders

On March 2nd the Special Orders Committee of the House of Lords reported to the House for affirmative resolutions the Exe Valley and the Machynlleth Electricity Orders.

The Grid

On March 6th Captain Fuller asked the Minister of Transport what the estimated capital expenditure of the electricity grid system was; how much had been expended to date; and if he was satisfied that the work would be carried out within the estimate.

Lieut.-Colonel Headlam, who replied, said that the annual report and accounts of the Central Electricity Board for last year showing the actual expenditure to December 31st were not yet published, but he understood that they would be available shortly, and would show the actual expenditure up to that date. As regarded the original estimated cost of the grid, including standardisation of frequency, he would refer Capt. Fuller to the eleventh report of the Electricity Commissioners (for the year 1930/31), where the position was set out.

A Gloucestershire Demand

On March 6th Mr. Perkins asked the Minister of Transport whether he was aware that there was a considerable demand from the inhabitants of Painswick, Gloucestershire, for electricity; and whether he would approach the Electricity Commissioners with a view to arranging for a supply.

Mr. Stanley said that the Electricity Commissioners had informed him that the question of establishing a public supply of electricity at Painswick had already formed the subject of communication between them and the undertakers concerned. The Commissioners hoped to get a definite decision from the company shortly.

Radio Licences

On March 6th Sir Kingsley Wood, the Postmaster-General, informed Mr. McEntee that the number of wireless receiving licences issued during 1932 was approximately 5,263,000. The number of prosecutions undertaken during the year for the use of unlicensed wireless sets was 2,825, and the total amount of fines and costs imposed was £2,833.

An E.P.E.A. Dinner-dance

The annual dinner and dance of the Kent Section of the Electrical Power Engineers' Association will be held on March 18th at the Co-operative Hall, Gravesend, at 6 for 6.30 p.m. Tickets can be obtained from Mr. F. H. Smethurst, hon. secretary of the Section, "Tremorvah," Lynton Road South, Gravesend.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Local Press and Domestic Development

No doubt E.D.A. is doing as much as lies within its present financial capacity to secure, in co-operation with some local authorities, publicity effort for domestic electrification, but investigation suggests that far greater use should be made of the local press for electrical propaganda of this kind. A systematic examination of many local papers indicates how little electrical news appears in the pages of these organs. In some of them there is only an occasional mention of electricity

Demonstrating how the new furniture "demothing" attachment for Electrolux vacuum cleaners works. Two other useful attachments are now available—a carpet "demother" and a sprayer for paints, disinfectants, &c.

in the news and seldom or never an advertisement of the local electricity undertaking. Yet the electrical facilities of a neighbourhood are often a deciding factor when choosing a district in which to live. Any enterprising business that has something to sell advertises it, but if an undertaking is not sufficiently awake to do so the local editor can hardly be blamed if he feels that the concern is not in earnest and its activities are of little interest to his readers. The opening of a new showroom is an occasion when a telling advertisement might be linked up with it for public appeal. It will be found in many districts that electrical news is acceptable to such papers if submitted in suitable form. Household matters are given plenty of space and such features as "Furnishing Ideas," "Hints for the Housewife," "The Modern Kitchen," and similar regular sections are parts of the papers offering opportunities for electrical hints provided they are supplied in convenient form, and not as blatant electrical "puffs" to which most editors object. All kinds of information of a newsy kind regarding cooking demonstrations, exhibitions, new appliances, hiring schemes, &c., the progress of different departments and so forth ought to be provided for the papers, correctly expressed by those who know how to do it.

Conditions in Portuguese East Africa

A report on the economic conditions in Portuguese East Africa has recently been published by the Department of Overseas Trade.

Import Duty Applications

The Import Duties Advisory Committee gives notice of an application for a reduction in the import duty on graphite electrodes of the following dimensions: Slabs, 1,000 mm. long by 175 mm. wide by 50 mm. thick; rods, 300 to 350 mm. long by 50 mm. diameter. Application has also been made for drawback under Schedule II to the Import Duties Act in the case of machinery (including machine tools) and hand or power driven tools for engineering and woodworking and parts thereof. Any representations which interested parties may desire to make should be addressed to the secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, S.W.1, not later than March 20th. The Committee announces that it has decided not to make any recommendations in respect of the application for drawback in the case of cupro-nickel tubes for oil and water coolers.

Success of the B.I.F.

Although the attendance (111,213) at the Birmingham Section of the British Industries Fair, which closed on Friday last, was about 30,000 less than in 1932, a report by the Board of Management indicates a considerable measure of success. While many exhibitors did much business, it is pointed out that the real influence of the Fair goes far beyond the immediate benefits it affords to British home and foreign trade. Demand for space for stands was so great this year that a number of late applications had to be refused, and the Board of Management will shortly consider the question of the further enlargement of the buildings. This year the public charge for admission was increased from 1s. to 2s. and the decrease in the attendance figures was largely due to the fact that on February 25th (public day) there were only 12,124 visitors as compared with 39,735 last year.

Organisation as a Science

An address on this subject was given by Mr. L. Urwick, director, International Management Institute, Geneva, before the Business Research and Management Association on Tuesday.

An Interesting Canadian Merger

The United Electrical Engineers, Ltd., is the title of a new company embodying a merger effected between four Canadian electrical companies established as subsidiaries in Canada by leading British engineering concerns. The parties to the merger are the Lancashire Dynamo and Crypto of Canada, Ltd.; Bruce Peebles (Canada), Ltd.; the Harland Engineering Co. of Canada, Ltd.; and Crompton Parkinson, Canada, Ltd. The merger is effective from April 1st. The head office of the new company will be in Montreal, with a branch in Toronto. The officers are as follows: Mr. C. G. Abbey, president and general manager; Mr. Brian M. Burt, vice-president and Ontario manager; and Mr. S. E. Gladwell, secretary treasurer. The lines of production will include electrical machinery, transformers, switching equipment, and electrical instruments.

A Manufacturers' Directory

The 1933 Red Book of the National Union of Manufacturers has just been issued. As in previous editions, the contents include the names of members of the various committees, alphabetical and classified list of members showing their principal products, and a list of affiliated associations. An addition to the new volume is a preface setting out the policy of British manufacturers as expressed through the Union.

A New Trolley-bus

A new type of trolley-bus has recently been supplied to the Llanelly Traction Co. by Leyland Motors, Ltd. The 65-h.p., 500/600-V traction motor was manufactured by the G.E.C. (type W.T.253B), and operates on 500/600 V d.c. The continuous rating is approximately 70 per cent. of the one-hour rating. The remote-control equipment comprises a foot-operated master controller actuating a bank of electro-magnetic contactors controlling the connections to the motor. The master controller is of the drum type and an interlock prevents its operation unless the reverse handle is in the "forward" or "reverse" position. Provision is made for field shunting and a definite step is incorporated so that it is impossible for a driver without hesitation to go from a full field to a weak field position.

A Leyland trolley-bus at Llanelly

The trolley gear is of the " Estler " super-imposed type, and each trolley boom includes an 18-in. taper trolley pole of heavy-rolled weldless steel tube of 35-40 tons per sq. in. tensile strength. A new type of skate is being fitted, comprising a plug and socket fitting designed to prevent damage to either skate, lead or chassis in the event of the skate becoming jammed in points or crossings. Should the skate become entangled in any trackwork the plug connection is merely withdrawn from the socket fitted to the chassis. The overload circuit breakers are of the totally enclosed, solenoid-trip, magnetic-blow-out type.

The auxiliary lighting is by a C.A.V.-Bosch 12-V constant-voltage dynamo driven from the front end of the traction motor. The capacity of the battery is 90 Ah.

New Gillingham Showrooms and Offices

The Gillingham Electricity Committee has approved plans for new offices, showrooms and sub-station in Gardiner Street, the cost being estimated at £6,750.

New Australian Companies

New companies registered in Australia recently include the Associated General Electric Industries, Ltd. (capital, £1,300,000), and Messrs. Crompton, Parkinson (Australia), Ltd. (capital, £33,000).

For Sale

The governors of the King's School, Bruton, Somerset, invite offers for plant.

(See our classified advertisements.)

Lighting Greyhound Tracks

The new greyhound racing track at Somerton Park, Newport, provides a good example of a well conceived and executed installation of " Mazdalux " reflectors. Over seventy reflectors of the dispersive type are employed to light the track, while various " Mazdalux " fittings are used to light the grand stands, car park, &c. The installation was planned by the Edison Swan Electric Co., Ltd., in collaboration with the contractors, Messrs. Campbell and Isherwood, Cardiff.

An efficient lighting installation at the new Somerton Park greyhound track, Newport

Registered Electrical Contractors

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting :—

Vickery, W. J., Cardiff.
Henderson & Priestley, Sandiacre, Notts.
Evans & Cole, Southsea.
Bell, Joseph, Middleton-in-Teesdale, Co. Durham.
Meyrick, Raymond A., Banstead.
Topping, T. R., & Son, Wigan.
South Manchester Electrical Co., Hulme, Manchester.
Callow & Dugdale, Mellor, Derbyshire.
Bligh, Sydney Wm., Canterbury.
Wavertree Radio & Electrical Co., Liverpool.
Atkinson, C. W., Northallerton.
Burch & Vertue, Ltd., Aldershot.
Norie, Robert, Monkseaton.
Holt, A. O., Rusholme, Manchester.

At the same meeting three applications were withdrawn and five were declined.

Dutch Glow Lamp Imports

A Bill has been introduced into the Dutch Second Chamber to authorise the extension for three months of the existing system of regulating the import of metal-filament lamps pending the results of an inquiry into the matter.

Trade Announcements

Messrs. David Brown & Sons (Huddersfield), Ltd., have transferred their London office to Bush House, Aldwych, W.C., under the management of Mr. A. Avison, A.M.I.E.E. The entrance hall of the suite will serve as an exhibition room for typical samples of the company's products.

The Keighley Gear Co., a subsidiary of Messrs. David Brown & Sons (Huddersfield), Ltd., has recently extended its service in the Lancashire area by the establishment of a new branch at Hampson Street, Salford.

Works Visits

On Wednesday last week H.R.H. the Prince of Wales made a tour of the St. Helens Cable & Rubber Co.'s factory, Slough, where he was received by Mr. D. Johnstone Sinclair, managing director, and Mr. H. Evans, general manager. Great interest was shown by the Prince in the various processes of manufacture of electric cables, particularly c.t.s., and he asked many questions regarding the general welfare of the workpeople, making several very thoughtful suggestions with a view to increasing their comfort. After leaving the factory he paid several visits to local welfare centres, and met groups of unemployed who gave him a very cordial welcome.

Members of the Managers' and Overlookers' Class of the Bolton Municipal Technical College, with friends, paid a visit to the works of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, on March 4th. The tour through the works was arranged to cover apparatus that would be of special interest to the textile industry, and included an extra-high voltage display.

The E.D.A. (North-West Area) Report

The report of the North-West Area Committee of the British Electrical Development Association for the year ended December 31st last states that four electricity supply undertakings were enrolled as members, whilst six increased their subscriptions. Thirty-one lectures, which were attended by 1,341 persons, were arranged by the Association. Campaigns were carried out during the year in connection with electric cooking and hotel lighting and bedroom heating. The Association assisted with the joint electrical exhibit of the Preston Corporation, the Lancashire Electric Power Co., and the Preston sub-branch of the E.C.A., at the Royal Lancashire Agricultural Show, by providing a supply of posters, literature, &c., and also rendered assistance in connection with exhibitions organised by the Fleetwood, Newton-in-Makerfield, and Colwyn Bay Electricity Departments. The Area Committee formed sub-committees to consider and make recommendations for the development of domestic sales, and it is anticipated that concrete proposals will be forthcoming as the result of their discussions. A conference of representatives of electricity undertaking members of the Association was held in Manchester in December to discuss the domestic electric water-heating business. During the year Mr. R. C. Hawkins (the Area Officer) had 108 interviews with members to discuss local activities and problems.

Changes of Name

The name of Messrs. J. G. White & Co., Ltd., is to be changed to Messrs. White Drummond & Co., Ltd. The occasion of this change is the passing of the controlling interest in the company into the hands of a British group. Mr. George M. Booth becomes chairman of the board, but the staff and the internal organisation of the company will remain unchanged.

Messrs. Underwoods (Purley), Ltd., 76, Brighton Road, Purley, have changed their name to Grovelands, Ltd.

The Electricity Supply Rifle League

The annual meeting of the Electricity Supply Rifle League was held on February 21st under the chairmanship of Mr. E. Harlow (City Co.). The hon. secretary and treasurer reported that the championship shield had been won by the City Co.'s team, whilst the Blackwall and Barking teams of the County Co. had annexed the 2nd and 3rd division shields respectively. The championship cup had been won by Mr. H. Blackmore, of the Blackwall team. Financially the League was in a very satisfactory position. Mr. G. C. Weston, M.I.E.E. (K. and K.), was elected president for the coming season.

Recent Contracts

The Iraq Petroleum Co., Ltd., has placed the complete contract for main oil-line pumps with Worthington-Simpson, Ltd. This important order, secured in world-wide competition comprises forty-five horizontal duplex double acting outside packed plunger forged fluid end pumps which will transport oil through the two great pipe-lines totalling 1,200 miles—from east of the Tigris to Tripoli and Haifa on the Mediterranean Sea. The pumps will be driven by 500-b.h.p. Diesel engines, delivering against a line pressure of 800 lb.

Messrs. Ruston & Hornsby, Ltd., have received instructions to put in hand eight 100-kW auxiliary generating sets for installation on two first-class passenger vessels now under construction at the Belfast Yard of Messrs. Workman Clark & Co., Ltd. The engines will be five-cylinder units working on the Ruston principle of airless injection.

The Sturtevant Engineering Co., Ltd., has recently received an order for the supply of two electrostatic precipitation plants for the removal of grits from flue gases of pulverised fuel-fired boilers at a London power station. The volume of flue gases to be handled by these precipitators is over 8,250,000 cu. ft. per hour.

Messrs. C. A. Parsons & Co., Ltd., have received from the Electricity Commissioners of South Africa an order for a second 20,000-kW h.p. turbo-generator and condensing plant, similar to the unit which the company recently supplied. Like its predecessor this machine will be installed in the Salt River power station, Capetown, and will generate 3-phase current directly at a pressure of 33,000 to 36,000 V. The turbine will be of the single cylinder high-pressure reaction type, running at 3,000 r.p.m. Steam will be used at a stop-valve pressure of 400 lb. superheated to 725 deg. F., and the turbine will exhaust into a condenser vacuum of 28.8 in.

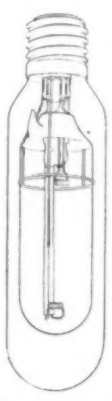
The E.D.A. in Scotland

The Scottish Area Committee of E.D.A. held its annual luncheon and general meeting on March 3rd at the Grosvenor Restaurant, Glasgow, Bailie T. S. Park, convener of the Glasgow Electricity Committee, presiding. Sir J. C. Watson, K.C., who proposed the toast of the Association, said that electrical power to-day made for the distribution of industry and as the grid extended effectively over the whole country it would make possible the economical development of local industry. Mr. C. H. Cox (chairman, E.D.A.), in reply, said that no one could deny the Association credit for its contribution to the growth of the electrical industry; it had certainly given the industry a good return for the small amount invested. It was to the domestic load that they must look for some years to come for the development of the supply industry.

Mr. A. C. Cramb (director and secretary) said they could not expect to develop the industry fully unless they adopted business methods. It was not sufficient to say they had so many thousand consumers. They had to see that those consumers were getting the best service possible, and to keep in mind that unless electricity was used in every possible way they were not going to get the price down. Councillor E. Walker, chairman of the Scottish Area Committee, presented to Mr. Jennison (G.E.C.) and Mr. McDougal (Glasgow Electricity Department), the Association's prizes in the Public Speaking Competition.

The South London Exhibition

In addition to the numerous displays demonstrating the applications of electricity in the home, the South London Exhibition which opened at the Crystal Palace on Wednesday includes a number of exhibits illustrating the latest developments in street lighting. The new "Mazda" sodium lamp shown on the stand of the County of London Electric Supply Co., Ltd., is made in two patterns for a.c. and d.c. and gives about 50 lumens per watt, consuming 80 to 100 W. The light is almost entirely in the yellow band of the spectrum, one or two per cent. being divided among relatively weak lines in the red, green and blue. Practically all the light output is in the visible band. The light source is a tube 5 in. long and 2 in. in dia., enclosed in a vacuum jacket to minimise heat loss and to keep the source at the temperature required for vapourisation of the sodium. The cathode is of the coated type requiring 16 W at 2 V, which is supplied by a small transformer. The rare gas filling gives a red colour on starting, but as the lamp warms, the yellow predominates until after ten minutes, the lamp is running at full efficiency at 3.5 A arc current, with a voltage drop of about 25 in both a.c. and d.c. patterns. The a.c. lamp has been found to run without flicker on a 50-cycle supply. Lamps can be run in series to make up the supply voltage, allowing only a small loss in the controlling resistance.



The "Mazda" sodium lamp

The lamp is made as a single unit, which is readily replaced on failure. There is also shown the photo-electric control including "daylight control," whereby street lighting is automatically started and stopped according to the amount of daylight. An interesting lamp exhibit symbolises the relations between lighting progress and the development of the grid system of transmission, and a model electric railway is shown working. Edison Swan lighting fittings, a complete range of the new Hotpoint labour-saving devices, and examples of Ferranti appliances are to be seen, as well as the Aidas water heating system and the neon lighting of Electrolumination, Ltd. The various services of the South Metropolitan Electric Light & Power Co., the South London Electric Supply Corporation, Ltd., and the County of London Electric Supply Co. are set out and form an interesting exhibit. The exhibition closes on March 18th.

Interior Shop Lighting

Something rather out of the ordinary in interior shop lighting is to be seen at the new premises of Dryad Handicrafts, Bloomsbury, W.C.1. Round two pillars the electrical contractors, Messrs. T. Clarke & Co., Ltd., have installed attractive cylindrical light boxes and, as our illustrations show, illumination is provided both from apertures in the bottom of the fittings and from indirect lighting obtained by the use of angular reflectors inside the boxes. The electrical installation also includes "Unity" tubular heaters.

A novel lighting installation at the new premises of Dryad Handicrafts, Bloomsbury, London

Social Events

Special lighting effects were a feature of the annual dance of the Hereford district of the Shropshire, Worcestershire, and Staffordshire Electric Power Co., at the Town Hall, Hereford, on Thursday, when over 250 dancers, including visitors from Birmingham, Kidderminster, Abergavenny, Hay, Aston Fields, Ross and other districts of the company attended. Imitation coal fires were used to heat the vestibules and corridors. The function was organised by the Sports Committee of the Hereford district.

The annual staff dinner of the Northmet Co. was held at the Park Lane Hotel, W., on Tuesday. In the absence of Lord Ashfield (chairman), due to illness, Sir Ernest Clark presided over a gathering of about 350. Capt. J. M. Donaldson (chief engineer), proposing the toast of "The Northmet Company," said that the second section of Brimsdown B station was now complete, bringing the installed capacity up to 100,000 kW; he paid a special tribute to the work of Mr. E. Zoller in this connection. Sir Ernest Clark responded, and at the same time proposed "The Guests." He said that the company now employed 2,366 men and paid £500,000 in salaries and wages. Mr. C. C. Paterson replied to the toast, and Mr. J. J. Gibbons proposed the health of "The Chairman." An excellent cabaret show and community singing followed the speeches.

Flexible Shafts

Messrs. Herbert Terry & Sons, Ltd., of Redditch, write pointing out that the list price of their flexible shaft outfit, complete with ¼-h.p. electric motor and accessories, is £17 2s. 6d., not £5 as stated in our issue of October 14th, 1932 (p. 556).

High-pressure Turbine for Russia

The first primary turbine unit for the Thermo-Technical Institute of Moscow, which is being built by the Metropolitan-Vickers Electrical Co., for steam conditions of 1,778 lb. per sq. in. abs., and 878 deg. F., exhausting at 384 lb. per sq. in. abs., is designed to withstand continuously a temperature of 932 deg. F., and for short periods 968 deg. F. The m.c.r. will be 24,000 kW at 3,000 r.p.m. The alternator is being built in Russia and steam is to be generated in high-pressure

Lœffler boilers. The turbine deals with the same steam quantity (300 tons per hour) as that for a condensing unit of about 84,000-kW output operating under similar high initial conditions, and, it is claimed, will be the largest unit yet built for over 1,000 lb. per sq. in. g.

The design of the cylinder follows to some extent that adopted for the three primary 12,500-kW, 2,400-r.p.m. turbines built by the same company for the Billingham station of Imperial Chemical Industries, Ltd. These were designed for initial steam conditions of 630 lb. per sq. in. abs. and 833 deg. F., exhausting at 275 sq. in. g., and have now been in commercial service for over three years. Speed governing is adopted, but the exhaust pressure is automatically maintained within certain limits by the transfer of load to or from condensing units in the station. Two steam chests are provided, one at either side of the cylinder as in the case of the Billingham plant, each chest containing four admission valves. There are thus eight steam connections, each of relatively small diameter, to the cylinder itself, which provide flexibility for expansion.

Tough Sheathing

In order to test the quality of their tough rubber sheathing for trailing cables Messrs. W. T. Henley's Telegraph Works, Ltd., requisitioned a 110-ton locomotive—the heaviest in the Holborn Viaduct station yard—and ran its two sets of bogie wheels over a length of standard four-core 0.225 sq. in. cable; the second bogie wheels remained in position on the cable for eight minutes; although the thickness of the tough rubber

The test—and after

sheathing on the cable is only ⅛ in. it was undamaged. The experiment was carried out on regulation fixed rails and in the presence of the station master and other railway officials.

The cable was subsequently examined in the company's research laboratories, when each core passed a satisfactory test for continuity. A current of 50 A was then passed through each core for a minimum period of five minutes without any over-heating being observed. Between each pair of adjacent cores a slowly increasing a.c. voltage was applied until breakdown occurred. In every case the breakdown voltage was observed to be 5 kV, from which it is inferred that the cable would have been perfectly safe for running at its normal voltage.

Prices of Materials

Messrs. F. Smith & Co. report, March 8th: Electrolytic copper bars and sheets, no change. Electrolytic copper wire rods, £38, £3 15s. dec. Electrolytic copper h.c. wire, 6 7/16d., ¼d. dec. Silicium bronze wire, no change.

Messrs. Edward Till & Co. report, March 8th: India-rubber, Para fine, 4¾d., ⅛d. inc.

Messrs. James & Shakespeare report, March 8th: Copper bars (best selected), sheet and rod, £59, £2 dec. English pig lead, £11 15s., 5s. dec.

New Catalogues and Lists

Garrard Engineering & Manufacturing Co., Ltd., Newcastle Street, Swindon.—A leaflet describing Garrard units for converting radio sets into radio-gramophones.

Painter Brothers, Ltd., Hereford.—An illustrated brochure dealing with the "P.B. Callender" pole.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 550, illustrating and describing the company's latest designs of lighting fittings.

Shaw, Son & Greenhalgh, Ltd., Albert Works, Huddersfield.—A folder relating to high-pressure valves and boiler mountings.

Watliff Co., Ltd., 175, Merton Road, Wimbledon, S.W.19.—A price list of fractional h.p. commutators.

Richard Johnson, Clapham & Morris, Ltd., Jacem House, Trafford Park, Manchester.—An electrical accessories price list (No. E2/33).

Harland Engineering Co., Ltd., B.E.P. Works, Alloa.—Publications dealing with truck type and type "D.W." metal-clad switchgear, and borehole and deep well pumps. Also a switchgear brochure in four languages.

Dominion Electrical Co., 6, Hanway Place, Oxford Street, W.1.—Leaflets describing the new "Liteon" batten and strip lighting holder and the "Lumiflex" insulated moulded link system of strip lighting.

English Electric Co., Ltd., Queen's House, Kingsway, W.C.2.—Several publications dealing with a new flameproof pillar, high-rupturing capacity fuse-gear, a new type of pit winder, air-break starters, polishing and splash proof motors, and the new mechanical injection, cold starting Diesel engine (type "K").

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—Publications Nos. H.C.860 and A.B.856, relating respectively to the "Ediswan" iron, and batteries, torches and accumulators.

British Insulated Cables, Ltd., Prescot, Lancs.—Leaflet P.F.107, on rust-proof rubber-insulated wires and cables.

G. D. Peters & Co., Ltd., Windsor Works, Slough.—A catalogue illustrating and describing the company's latest "Plastic Arc" welding equipment and "Colour Tipt" electrodes.

Best & Lloyd, Ltd., 40, Great Marlborough Street, W.1.—An illustrated list (No. 189) of unit and utility fittings for shops, schools, offices, public buildings, hospitals, &c.

Metallic Seamless Tube Co., Ltd., Ludgate Hill, Birmingham.—A leaflet showing the "Zephyr" fan which has just been placed on the market.

Simplex Electric Co., Ltd., 159, Great Charles Street, Birmingham.—Four publications dealing with "Credalux" lighting equipment, switchgear, cooker control units, and "Creda Vulcan" tubular electric heaters.

National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne.—The February issue of the "National Bulletin" containing particulars of marine heavy oil engines, small self-contained oil engines, &c.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A modern style lighting fittings catalogue (No. F.6357).

Verityx, Ltd., Aston, Birmingham.—A leaflet entitled "Maxlumination," published in connection with the new "Maxlume Overlamp" reflector.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—The March list of surplus new and second-hand electrical materials.

Sloan Electrical Co., Ltd., 8, 10 and 12, Golden Lane, E.C.1.—A loose-leaf general electrical supplies catalogue containing over 400 pages, copiously illustrated.

Brook Motors, Ltd., Empress Works, Huddersfield.—List No. 344 dealing with "C" type squirrel-cage motors.

Hopkinsons, Ltd., Britannia Works, Huddersfield.—A brochure giving a description of the company's works, processes and manufactures.

G. P. Cosway, Ltd., Coton Road, Nuneaton.—An illustrated list of "Dred-Nort" link disconnecting boxes and other standard products.

Isaac Griffiths & Sons, Imperial Tube Works, Wednesbury.—An abridged price list of conduits and fittings.

Ferranti, Ltd., Hollinwood, Lancs.—Leaflet No. Wb.523, announcing revised prices of a.c. radio power units.

Bankruptcy Proceedings

H. Bannister, electrical goods factor, 48, Old Mote Lane, Withington, lately trading as H. Bannister & Co., 8, Newmarket Lane, Manchester.—The receiving order was made on a creditor's petition recently, and according to the statement of affairs lodged the gross liabilities amount to £1,478, of which £1,431 is expected to rank for dividend. The net assets are estimated to realise £556, so that there is a deficiency of £556. The debtor attributes his failure to lack of capital, heavy overhead charges and selling at too small a margin of profit.

H. Fraser and R. J. Ardern (trading as Ardern and Fraser), electrical appliances, wireless sets and washing machine dealers, 29, Church Street, Accrington, Lancs.—After further questions had been put to these debtors by the Official Receiver the public examination was closed recently at the County Court House, Victoria Street, Blackburn.

A. Peat, electrical engineer, White Hart Street, Mansfield, Notts.—The public examination of this debtor was held at the County Court House, Nottingham, on March 2nd. A statement of affairs was filed which disclosed a deficiency of £473. The hearing was concluded.

D. S. B. Shannon, electrical engineer, Carlton Chambers, Lichfield Road, Mere Green. Receiving order made February 21st on debtor's own petition.

H. L. McIvor, electrical engineer, 92, High Street, Ewell.—First meeting to-day (Friday) at 29, Russell Square, W.C. Public examination March 23rd at the County Court, Croydon.

A. Robson (Anson Radio), wireless engineer, 147, Dickinson Road, Rusholme, Manchester.—First and final dividend of 5s. 2d. in the £, payable March 7th at the Official Receiver's office, Byrom Street, Manchester.

Company Liquidations

Ward Electrical Co., Ltd., 155, Wardour Street, W.—The report by the Official Receiver shows liabilities of £3,917, against assets of £879, leaving a deficiency of £3,133 with regard to contributories, the issued capital amounting to £95. The failure of the company is attributed to lack of working capital which necessitated the company accepting bills in payment of accounts which could only be disposed of at heavy rates of discount, and to losses sustained through bad debts. Mr. W. A. J. Osborne has been appointed liquidator with a committee of inspection.

Timms & Aldridge, Ltd., electrical contractors and wireless dealers, The Arcade, High Street, Burnham.—The statutory meeting of creditors was held recently at the offices of Messrs. Thomas, Mundy & Co., 194, Lavender Hill, S.W.11, when the statement of affairs showed liabilities of £496, of which £402 was due to the trade, and net assets of £36, leaving a deficiency of £460. The directors had decided that the company should be wound up and passed a resolution nominating Mr. H. C. Mundy as liquidator. The creditors confirmed that appointment.

Economic Electric, Ltd.—Meeting April 6th at 28, King Street, Cheapside, E.C., to receive an account of the winding-up by the liquidator, Mr. A. Page.

Townson & Ward, Ltd.—Winding-up voluntarily. Liquidator, Mr. H. Mossop, 131, Ramsden Square, Barrow-on-Furness.

Electricity Supply

Lighting, Domestic, Power

Alnwick (Northumberland).—HOUSE INSTALLATIONS.—Tenders are to be obtained by the Rural District Council for the installation of electricity in new houses being built at Shilbottle.

Angus.—CHARGES FOR SCHOOL LIGHTS.—At a recent meeting of the Education Committee it was complained that the Grampian Electricity Supply Co. was overcharging for electric lighting for schools, and the Committee decided that it would not proceed farther with electrical installations in schools unless a substantial reduction in charges was made.

Arran.—EXTENSIONS.—The electricity supply in Arran is to be extended, and plans have been prepared for the erection of a power house at Pierhead, Brodick, to supply Lamlash, Whiting Bay, &c.

Barking.—MAINS AND SERVICES.—The Electricity Committee is applying for sanction to the borrowing of £15,000 for mains and services.

INCREASED SUPPLIES.—The electrical engineer has been asked to report on the question of giving increased supplies to Block Batteries, Ltd., Austins (East Ham), Ltd., and O'Gorman's, Ltd.

Barnstaple.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £1,500 for mains, and also the consent of the Ministry of Transport to the use of overhead lines in the area included in the Special Extension Order.

Blackpool.—DEMAND FOR FREE INSTALLATIONS.—Blackpool Trades Council has passed a resolution urging the Electricity Committee to provide free installation of services to local properties. The mover stated that mains were now only taken to the garden walls, and that after that the work had to be paid for at the rate of 18s. 6d. per yard. He believed that Blackpool was the only town in Lancashire where such a charge was made when people required an extension.

Blyth.—OVERHEAD LINES SANCTIONED.—As a result of an inquiry the Ministry of Transport has consented to the erection of overhead lines from Bebside Station to Cowpen Newton by the North-Eastern Electric Supply Co., Ltd.

Bolton.—EXTENSION OF SUPPLY AREA.—The Electricity Department will shortly be in a position to supply electricity to premises in the borough adjacent to the Harwood district, which are now being supplied by the Turton Urban District Council.

Burnley.—MAINS EXTENSIONS.—The Electricity Committee is extending mains in various districts at a cost of £608.

NEW ELECTRICITY CHARGES.—New charges for electricity have been decided upon. A consumer using over 10,000 kWh per annum for industrial purposes will be allowed power rates for lighting up to 5 per cent. of the total consumption for power purposes. There will be a special lighting charge of 2d. per kWh to a consumer taking a supply through a two-rate meter between 8 p.m. and sunrise the following day, provided that he pays the cost of a special time switch. Lighting supplies through pre-payment meters will be reduced from 5d. to 4½d. per kWh.

Canada.—UTILISATION OF WATER POWER.—The Dominion Water Power and Hydrometric Bureau reports that, of the 7,045,260 h.p. representing Canada's total hydraulic installation at the beginning of the year, 6,111,641 h.p. is installed in central stations from which energy is distributed for domestic, municipal, commercial, and industrial use. A considerable proportion of the power generated by this installation is sold *en bloc* for the manufacture of pulp and paper, for the mining and reduction of minerals, and for electro-chemical production. The power plants of pulp and paper mills account for 600,996 h.p. of the total, and in addition Canadian pulp and paper companies have motor equipment aggregating 1,007,000 h.p. for operation by electricity purchased from central stations. General industrial plants and electric railways account for 332,623 h.p. The total hydro-electric installation of the Dominion averages 670 h.p. per thousand of population.

THE MASSON FALLS SCHEME.—Good progress has been made with the Quebec Power Company's Masson Falls scheme. The boring of a tunnel a mile in length has been completed, with the exception of the last 100 ft., and the development is expected to be ready for operation by July.

Cheltenham.—EXTENSION SCHEME.—The Electricity Committee is to proceed with a scheme, costing approximately £8,200, for an extension of the supply from Leckhampton Church, through Shurdington and Badgeworth, to the Reddings, and proceeding through Bamfurlong, Golden Valley, and the sewage works to the sub-station at Haydon's Elm.

SAFEGUARDING ELECTRICAL CONTRACTORS.—At a recent meeting of the Housing Committee, Messrs. Bastin, Honeysett, and Tandy attended as a deputation from the electrical contractors with regard to safeguarding the position of sub-contractors executing electrical work on housing contracts. The architect was instructed to see that when a certificate has been issued which includes payment for work carried out by a sub-contractor the receipts for such work are produced before another certificate is issued.

China.—NEW POWER STATION AT HANGCHOW.—A new power station having two 7,500-kW generating sets has recently been completed at Hangchow. It is designed for an ultimate installed capacity of 80,000 kW. The turbo-generator sets were made by British Thomson-Houston Co., Ltd., the turbines being of the eighteen-stage impulse type, designed for steam at 350 lb. per sq. in.

Clitheroe.—REVISION OF TARIFF.—Revisions in the electricity tariff will involve concessions to consumers amounting to £1,000 a year. The all-in tariff is to be extended to Chatburn and Worston, the fixed charge being based on floor area; the "unit" charge will be 1d., with a reduction to ½d. after a certain quantity has been consumed. Another concession is a fixed meter charge of 5s. per quarter, instead of varying amounts. Town consumers are to be given a reduction of 1d. a kWh after a minimum quantity has been used for lighting.

Clydebank.—LIGHTING OF WEST KILBOWIE BUNGALOWS.—The Town Council is considering the advisability of having the West Kilbowie bungalows lighted by electricity. There are over two hundred of these. Additional lights are to be installed on the extended portion of Mount Blow Road.

Colchester.—TRANSFORMER REQUIRED.—The Electricity Committee recommends the provision of a further 1,500-kVA transformer at the power station at a cost of £2,000.

EXTENSIONS.—Sanction has been received to the borrowing of £1,505 for a spur line to Wakes Colne and £4,750 for the line from Ramsey to Bradfield. A spur line costing £722 is to be provided to St. Osyth Beach, near Clacton-on-Sea.

Dartford.—FURTHER CONCESSIONS.—The Electricity Committee recommends that the existing two-part tariff for shop lighting of £10 per kW per annum plus 1½d. per kWh be reduced to £10 per kW plus 1d. per kWh, that the minimum charge be reduced from ½ to ¼ kW, and that the maximum meter rent should be 1s. 9d. per quarter, except where meters are installed solely for the benefit of consumers.

Devon and Cornwall.—SPECIAL ORDER.—The West Devon Electric Supply Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in the parishes of North Tamerton, Boyton, Jacobston, Kilkhampton, Launcells, Morwenston, St. Gennys, Stratton, Week St. Mary, Whitstone, Poundstock (part), Alwington Buckland Brewer, Bulkworthy, Clovelly, East Putford, Hartland, Newton St. Petrock, Parkham, Welcombe, Woolfardisworthy, Buckland Filleigh, Langtree, Peters Marland, Petrockstow, Shebbear, and Sheepwash, and in the rural districts of Broadwoodwidger and Holsworthy (Devon portion).

Dorchester.—CABLES.—The Electricity Committee is to apply for sanction to a loan of £2,000 for cables.

Durham.—SCHOOL HEATING.—The County Education Committee has adopted reports by the architect arising out of the request of the Board of Education to consider the possibility of installing water-heating systems for the additional buildings at the Billingham, Blackhall Colliery, Bloemfontein, Horden Colliery and Seaham Intermediate Council Schools, and has forwarded copies to the Board, with a request that it will approve the proposals for heating the buildings by electricity.

Eastbourne.—RELIEF OF RATES.—The Electricity Committee recommends a contribution of £2,500 from the profits of the undertaking towards the relief of the rates; last year's contribution was £6,000. With regard to next year's estimates the treasurer reports that he is doubtful if as much profit will be made in view of the heavy charges in connection with the rural extensions.

MAINS EXTENSIONS.—Application is to be made for sanction to borrowing of £8,000 for mains extensions.

East Ham.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £4,343.

Easton-on-the-Hill.—ELECTRICITY SCHEME APPROVED.—The Rural District Council has approved the Mid-Lincolnshire Electricity Co.'s scheme for supplying the district.

Eccles.—SUPPLIES FOR MONTON.—The Corporation is to extend mains and provide a transformer kiosk at a cost of £1,130 to supply parts of Monton.

SUB-STATIONS.—The Electricity Committee recommends seeking sanction to a loan of £3,000 for the provision of three-phase consumers' sub-stations and equipment.

Elland.—REDUCED POWER CHARGES.—The Urban District Council has reduced its sliding scale of charges for power from 4d. to 2d. per kWh, less 17½ per cent., to 3½d. to 1½d., less ten per cent.

Erith.—CHEAPER ELECTRICITY.—The Urban District Council has reduced its charges for electricity as follows: Private lighting, from 3½d. to 3¼d. per kWh; domestic power, from 1d. to ½d.; domestic heating, from ¾d. to ½d.; prepayment supplies for heating and cooking, from 1d. to ¾d.

Exeter.—APPARATUS FOR HIRE.—The Electricity Committee is to apply for sanction to the borrowing of £10,000 for the purchase of domestic apparatus for hire purposes.

RELIEF OF RATES.—A contribution of £2,000 towards the relief of the rates for the forthcoming year is to be made from the funds of the electricity undertaking.

Fife.—HOUSEHOLDERS' COMPLAINT.—A petition has been sent to the County Council by the tenants of Council houses asking for a rebate of rent because of the inconvenience caused by their having to use paraffin lamps in place of electric light, over the installation of which there has been a delay.

France.—220-kV TRANSMISSION LINE.—The Société de Transport d'Energie Centre-Ouest has recently been authorised to proceed with the erection of a 220-kV overhead line between Eguzon and Distré, a distance of about 100 miles.

Gillingham (Kent).—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to the borrowing of £10,945 for mains and plant.

Glasgow.—REWIRING OF MARKETS AND SLAUGHTERHOUSES.—The Markets Committee recommends the rewiring of the electrical installations in the markets and slaughterhouses at an estimated cost of £7,780.

MAINS EXTENSIONS.—Distributing mains are to be laid at a cost of £2,058.

PROGRESS IN JANUARY.—Under the Electricity Department's scheme fifty-six houses were wired in January, making the total to date 37,012. Hired appliances installed now number 18,932.

CHARGES IN SHETTLESTONE AND TOLLCROSS AREA.—For the remainder of the current financial year the rates of charge to consumers in the Shettleston and Tollcross area taken over by the Corporation from the Clyde Valley Electrical Power Co. are to be on the same basis as those charged by the company, and the question of rates is to be reviewed at the end of the financial year. Negotiations are to be continued with the company upon the subject of bulk supply rates.

Guildford.—OVERHEAD LINES AT PUTTENHAM.—The Mid-Southern Utility Co. has applied to the Rural District Council for consent to the erection of l.p. overhead lines at Puttenham. The Council has decided to withhold consent, and to call the attention of the Ministry of Transport to the fact that the proposed overhead lines formed part of the company's original proposal, which was the subject of an inquiry last September, and to which the Ministry had refused consent.

Hailsham.—OVERHEAD LINES EXTENSION.—The Rural District Council has approved the extension of l.p. overhead lines for the supply of electricity in the district by the Eastbourne Corporation. A difficulty has arisen with regard to the supply of electricity to property on boundary roads in the area of the Weald Electricity Supply Co., Ltd., and, subject to the latter's consent, a Fringe Order will be applied for to remedy the matter.

Hornchurch.—COUNCIL HOUSE INSTALLATIONS.—The Urban District Council has consented to electric lighting being installed at Council houses in Osborne Road provided that the cost is borne by the tenants.

India.—RURAL ELECTRIFICATION IN MYSORE.—Reviewing the activities of the Electrical Department during the past year, the Government of Mysore refers to further progress in rural electrification and states that a further sixteen villages adopted electricity in addition to two more towns. The net revenue realised on the State works for the year gave a return of 4.46 per cent. on the total capital invested. With a view to stimulating progress and popularising the use of electricity in rural areas especially, the Government has sanctioned the following measures: (1) the reduction of the initial deposit by purchasers of irrigation pumps by hire-purchase system from Rs. 200 to Rs. 100; (2) the withdrawal of conditions regarding the minimum charges in the case of flour mills, and the fixing of a rate of one anna per kWh for power used in show rooms, with a charge of eight annas per month per light in the case of installations having not more than three lights; and (3) the withdrawal of the condition regarding the guarantee of a minimum return of 12 per cent. on capital cost in the case of bungalows when the capital cost does not exceed Rs. 1,000.

Isle of Man.—THE ELECTRICITY SCHEME.—The people of the Isle of Man have apparently abundant faith in the future of electricity, for in response to the issuing of £80,000 worth of 4 per cent. stock for the purpose of carrying out an electricity scheme in the small towns and rural districts of the island, the Isle of Man Electricity Board received applications for nearly £600,000 worth of stock, all from residents of the island. The scheme is being administered by a Board appointed by the Governor of the island, and embraces the distribution of electricity to every part of the island outside Douglas. The energy is to be purchased in bulk from Douglas Corporation, and distribution will be by means of overhead h.p. lines on wooden poles. Messrs. Johnson & Phillips, Ltd., secured the contract for the distribution system, the contract for the erection of the transformers, etc., being placed with Messrs. Oliphant & Co.

FURTHER POWERS FOR DOUGLAS.—New powers are being sought by the Corporation which proposes to amend the Light and Power Act, 1921, by obtaining authority to erect overhead lines and to make certain minimum charges, according to the quantity of electrical energy supplied. It is also intended to obtain a declaration that no person shall be entitled to restrain them from using its present or any future generating station.

Lewes.—ELECTRICITY CHARGES.—Electricity charges were discussed at a meeting of the Lewes Chamber of Commerce last week. Mr. S. J. Stevenson referred to alleged inequalities in the prices charged for electricity, and several other members made similar observations. It was eventually decided to appoint a committee to make inquiries and to arrange for an interview with the directors of the Lewes and District Electric Supply Co., Ltd.

Luton.—OVERHEAD LINES SANCTIONED.—The Town Council has received the sanction of the Ministry of Transport to the use of overhead lines for the supply of electricity to Toddington, Harlington, Sundon, Caddington, Ivinghoe, and Cheddington, and a loan of £8,926 has been applied for in this connection.

Manchester.—LOANS.—Sanction is being sought by the Electricity Committee to loans of £250,000 for mains and £10,000 for sub-station buildings.

INDUSTRIAL WATER-HEATING.—The tariff for night water-heating for commercial and industrial purposes is to be standardised at 0.4d. per kWh.

MORE RECORDS BROKEN.—The Corporation's output of electricity during January (49,357,920 kWh) was the highest yet reached in any one month, while the highest simultaneous maximum demand was recorded on January 23rd. Connections during January showed an increase of 1,692 kW, bringing the total up to 527,293 kW, and applications for supplies (including additional supplies) numbered 1,681, representing a total of 3,359 kW. There were 105 new cookers connected, making a total of 10,961 now on circuit, while orders received for the hire of cookers amounted to 157. Hired wash-boilers now total 399.

Mareham (Lincs).—SUPPLY INAUGURATED.—A supply of electricity provided by the Mid-Lincolnshire Electric Supply Co., Ltd., was recently inaugurated by the chairman of the Parish Council, Mr. G. E. Hodgson.

Middleton.—NEW SUB-STATION.—The Town Council is to erect a sub-station costing between £10,000 and £11,000.

New Forest.—FURTHER "PYLON" OBJECTIONS.—The Ringwood and Fordingbridge Rural District Council is to oppose the proposal of the Central Electricity Board to carry overhead lines through Woodgreen, Hole Breamore, Sandleheath, and Fordingbridge just outside the Forest. A deputation is also to wait on Major J. D. Mills, M.P. for the division.

Oakham.—SUPPLY ARRANGEMENTS.—The Rural District Council, which recently made formal application to the Ministry of Transport to revoke the powers of the Oakham Gas & Electricity Co., Ltd., so far as they apply to the rural district, has been informed that the company has decided to take immediate steps to supply electricity to Ashwell, Burley, Langham, and Braunston, and that the question of supplying Whissendene is to be considered at a later date. The Council is to inquire when supplies will be available in the parishes named, the proposed charges, the reason for the exclusion of the parishes of Barleythorpe and Whissendine, and the earliest date at which the company proposes to supply the last two places.

Oldham.—METER RENT REDUCTION.—The Electricity Committee is to reduce the rent of ordinary meters from 1s. 3d. to 9d. per quarter.

Perth.—SUPPLY FOR BURGHMUIR DISTRICT.—As a bulk supply is now available from the Grampian Electricity Supply Co., a supply of electricity is to be given to the Burghmuir district.

Plymouth.—THE FREE WIRING SCHEME.—The local registered electrical contractors are prepared to agree to a charge of 15s. per point for providing plug points in connection with the free wiring scheme.

St. Helens.—RELIEF OF RATES.—A sum of £6,000 from the profits of the electricity undertaking is to be allocated to the relief of rates.

Shincliffe (Co. Durham).—STREET LIGHTING PROPOSALS.—The question of lighting the parish is again to be discussed. Over four years ago a scheme was formulated for the street lighting but was rejected. There is at present no means of illumination, and it is understood that electricity is favoured.

Southport.—ALTERATIONS TO PLANT.—The Electricity Committee has authorised the alteration of plant at the electricity works made necessary by the increased steam pressure.

Spalding.—OFFERS TO PURCHASE UNDERTAKING.—The Urban District Council has received two offers for the purchase of its electricity undertaking—one from a group of financiers, and the other from a Boston electricity company. The Electricity Commissioners offer no objection to the sale provided that there are reductions in the charges for electricity.

Stainburn (Workington).—THE CENTRAL BOARD'S SUB-STATION.—It is expected that the sub-station of the Central Electricity Board at Stainburn will be ready for use in April. From this point electricity will be supplied to the towns and villages in the western part of the Mid-Cumberland Electricity Co.'s area of supply to a radius of about fifteen miles.

Stanhope (Co. Durham).—ELECTRICITY CHARGES.—The Urban District Council is seeking a reduction in the local electricity charges.

Sunderland.—Price Reductions.—Reductions in lighting and small power charges, involving a concession of about £7,000 a year to consumers, are recommended by the Electricity Committee. The lighting rate is to be reduced by 1d. per kWh, affecting 3,000 consumers. Licensed premises are to receive a 12 per cent. reduction and intermittent larger customers will receive a concession of about 11 per cent. The power factory and workshop rate fixed charge of £4 per annum per kVA is to be lowered to £3 5s.

Tenterden.—Council's Proposals.—The Rural District Council has decided, if the mains of the Weald Electricity Supply Co., Ltd., are extended to Rolvenden Layne, to have Council houses there wired, and also to consider the provision of electric street lamps.

Tynemouth.—Plant Required.—A voltage regulator and a mercury rectifier are to be purchased by the Town Council.

Uttoxeter.—Electricity for Rocester.—The Rural District Council has given its consent to the erection of overhead lines by the Urban District Council in order to give a supply of electricity to Rocester.

Wallasey.—Relief of Rates.—Provision is being made for £6,500 to be transferred from the profits of the electricity undertaking for the relief of rates. A surplus of £10,000 is anticipated, and provision is made for spending £4,000 on new meters.

Weymouth.—Mains Extensions.—The Electricity Committee is to extend mains at a cost of £644.

Wick.—The Electricity Undertaking's Finances.—The Town Council has agreed to a recommendation of the Finance and Lighting Committees that the Electricity Commissioners be asked to investigate the position of the Wick electricity undertaking, to ascertain if it is sound financially.

Wimbledon.—Loans Sanctioned.—The Electricity Committee has received sanction to the borrowing of £45,000 for mains and services, and £15,000 for domestic electrical apparatus.

Winchester.—Loans Sanctioned.—The Town Council has received sanction to loans of £35,000 for mains and £12,000 for plant in connection with the change-over.

Worthing.—Electric Heating of Southern Pavilion.—The Entertainments Committee has asked for an estimate of the cost of heating the Southern Pavilion by electricity.

York.—Mains and Services.—The Electricity Committee is to apply for sanction to the borrowing of £30,000 for mains and services.

Traction

Blackpool.—New Tramcars.—At a recent meeting of the Transport Committee the transport manager reported on the question of providing new tramcars, and submitted a model of a proposed new single-deck vehicle to seat fifty-two passengers, combining various modern features and improvements. He was authorised to order forthwith one new vehicle of the type referred to under a provisional quotation submitted by the English Electric Co., and also to purchase a tramcar motor of a type suggested, and, if found satisfactory, to obtain an additional nine sets.

East Ham.—Loss on Trams.—It is reported that the estimated deficiency on the trams for the year just closing is likely to be £16,000.

Glasgow.—Electrification of Subway.—A test of an electrically driven train in the Glasgow Subway is expected to be made at the end of this month on the section between Copland Road and Merkland Street. For some time the work of installing four electric motors in a carriage, together with the necessary switches and controls, has been proceeding, and it is to be hoped that the vehicle will be ready for trial shortly. The experiment is designed to test the possibilities of substituting electricity for the existing cable system. There was a deficit of £40,000 on the Subway last year.

Lanarkshire.—Traffic Signals.—The County Road Board has agreed to the installation of automatic traffic signals at a number of points in the county.

Leeds.—The Transport Question.—Important changes in the existing transport system of Leeds are foreshadowed by an official survey of traffic which is now in progress. It is proposed that buses shall replace the trams now operating on the following routes: Belle Vue Road, Domestic Street, Guiseley, Halton, Hyde Park, and Woodhouse Street, and South Accommodation Road. Tests are at present being carried out by the Tramways Committee with vehicles operated by various types of oil, but no decision has yet been arrived at. At present the Corporation has tramcars on thirty routes, and buses on twenty routes, including the joint service with the Bradford Corporation to Stanningley and Bradford. This service, together with those from Leeds to Otley and Burley, runs for a large part of the way over tramways at present served by the Corporation. It is thought that the change-over will be complete within two years, but, in any event, the sanction of the Yorkshire Traffic Commissioners will first have to be obtained.

Northern Ireland.—Belfast.—The substitution of trolley-buses for trams is to be considered.

Rotherham.—New Motors for Trolley-buses.—Reporting to the Transport Committee on tests carried out on a new design of motor for use in trolley-buses, the transport manager states that the result shows that there is a reduction in consumption of electricity of 0.31 kWh per mile, and that if the whole fleet of trolley-buses was fitted with this type of motor there would be a saving of £1,000 a year in the cost of electricity. The Committee has agreed to a suggestion that twenty-two trolley-buses shall be so converted at a cost of approximately £140 per vehicle.

South Africa.—Trolley-buses for Durban.—The Corporation is proposing to abandon the tramways on two important city routes and to substitute trolley-buses. There are at present about 39 miles of tramway track in Durban.

Southern Railway.—Success of Electrification.—Speaking at the annual meeting on March 2nd, Mr. G. W. E. Loder, chairman of the Southern Railway Co., said that taking the system as a whole, the number of passenger journeys showed a decrease of 7,300,000, or 2.2 per cent. An analysis of that decrease revealed the significant fact that while in the electrified area the decrease was 2,600,000 passenger journeys, or 1.2 per cent., the decrease outside the electrified area was 4,700,000 or 4.5 per cent. The first stage of the extension of the electrification to Brighton and Worthing—from Coulsdon to Reigate and Three Bridges—was completed in July last, and in the first 5½ months the revenue from the traffic on that section increased by 13½ per cent. Electrified working on the remaining portion of the line commenced on January 1st, and for the month of January there was an increase of 73,000 passengers and of £2,500 in receipts, or nearly 5 per cent. There were already indications of coming developments in the districts through which the railway passed, and there could be no doubt that large and increasing numbers would be attracted by the improved service of trains to reside in those districts.

Wallasey.—The End of the Trams.—By October 1st next the whole of the town's tram services will have been replaced by buses.

Communications

Great Britain.—Radio Relay Exchanges.—The Berkshire County Council has decided not to object to the Maidenhead Radio Service, Ltd., carrying wires over county roads in the borough and adjoining areas.

The Wellington (Salop) Urban Council has refused applications to establish a service in the town.

The Leeds Parks Committee has refused the application of Radio By-Wire, Ltd., for permission to erect poles on land belonging to the Corporation on the Ivy House Estate.

The Kidderminster General Purposes Committee has decided not to grant the application from the Broadcast Listeners Service, Ltd., to operate a relay service in the town.

The Godmanchester Town Council has granted an application by Osman & Co. to establish a service in the borough.

India.—Short-wave Broadcasting.—Hitherto the Calcutta broadcasting station has served a local area of a radius of about 300 miles. More listeners are now to be served by the Indian State Broadcasting Service's short-wave transmitter which was recently opened at Cossipur.

Legislation.—Our Indian Correspondent reports that Sir Frank Noyce, Government of India Member for Labour and Industry, recently introduced a Bill in the legislative assembly to regulate the possession of radio-telegraph apparatus. There were, he said, many cases of broadcast "piracy," and the object of the Bill was to prevent possession of apparatus without a licence by providing penalties. The financial position of the service was radically unsound and there was no prospect of any improvement of the service, nor could more transmitting stations be established without increased revenue.

On behalf of the public it was urged that the wider aspect of the utility of the service for mass education and mass entertainment should be taken into account. The service of the Madras Corporation was becoming very popular, and Lahore and Poona were attempting to follow Madras. It is expected that there would be shortly provincial broadcasting services catering in particular provincial languages as a means of mass education and entertainment. When such services could be established, some arrangements could be reached by which a portion of the licence fee could be given back to provincial governments.

Philippine Islands.—Radio Telephony.—A wireless-telephone service between Manila and Berlin was inaugurated on March 1st.—*Reuter.*

South Africa.—Slangkop Wireless Station.—Comprehensive improvements to the Union Government's wireless station at Slangkop are being carried out. New receiving equipment is being installed, and it is hoped shortly to replace with modern plant the short-wave apparatus which was recently transferred to the Cape Town airport wireless station. The aim is to render Slangkop the most modern coastal station in South Africa. It is to have a range of from 5,000 to 6,000 miles on the ordinary shipping wavelength band of 600 metres, and it will also be in touch with ships using short-wave sets in all parts of the world.

Sweden.—A big new underground telephone cable is to be laid between Malmö and Gothenburg at a cost of Kr. 8,650,000 —*Reuter's Trade Service.*

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Alderley Edge & Wilmslow.—Electricity Board. Electrical stores. (February 24th.)

Australia.—MELBOURNE.—May 2nd. Post and Telegraph Department. Loading coil pots. (A.X. 11716.)*

BRISBANE.—May 15th. City Electric Light Co., Ltd. Coal conveyor. Company's offices, Boundary Street, Brisbane (specifications £2 2s.).

June 22nd. 45- and 11-kV switchgear. Company's offices (specifications £2 2s.).

July 20th. Supervisory control equipment. Company's offices (specifications £2 2s.).

SYDNEY.—March 31st (extended from February 13th). Electricity Department. Twenty-six double secondary current transformers. Stores superintendent, Electricity Department, Town Hall.

Cardiff.—March 20th. Electricity Department. E.h.p. and l.p. overhead lines and pole-mounting transformer and switchgear at Peterston-super-Ely. (February 24th.)

China.—Chinese Government Purchasing Commission. Insulated cables. (See this issue.)

Carlisle.—March 15th. Electricity Department. Transformers. (March 3rd.)

Darlington.—Town Council. Rewiring of the fire station. Chief officer, Fire Brigade.

Dumfries.—County Council. 33- and 11-kV air break switchgear. (February 24th.)

March 14th. Various works in connection with the erection of electricity sub-station, &c., at the County electrical headquarters, Marchmont. J. Robson, county clerk, County Buildings, Dumfries (deposit £1 1s.).

Ealing.—March 24th. Electricity Department. Switchgear, voltage regulators and transformers. (See this issue.)

East Sussex.—March 13th. Public Assistance Committee. Electric lamps for six months for eleven institutions. P.A. Officer, West Street, Lewes (tender forms 1s. per copy).

Farnworth.—March 11th. Electricity Department. L.p. cables and disconnecting feeder pillar. (March 3rd.)

Frimley & Camberley.—March 18th. Urban District Council. Vehicle actuated traffic control signals. (See this issue.)

Galloway.—March 28th. Galloway Water Power Co. Construction of Glenlee pipe-line. Sir Alex. Gibb and Partners, Queen Anne's Lodge, Westminster, S.W.1 (fee £10 10s.).

Great Western Railway.—April 6th. Electric wires and cables, telegraph ironwork and lamps. (See this issue.)

Halifax.—March 20th. Health Committee. Boilerhouse plant for Isolation Hospital. (See this issue.)

Hull.—March 21st. Electricity Department. (*a*) Static transformers, lamp posts, and brackets; and (*b*) time switches. (March 3rd.)

India.—NEW DELHI.—March 27th. Indian Stores Department. Sac negative elements for Leclanché cells. (A.X 11719.)*

Kirkcudbright.—March 25th. County Council. Electrical installation work in connection with assisted wiring scheme. Messrs. Buchan & Partners, 16, Young Street, Edinburgh (deposit £1 1s.).

Leeds.—Public Assistance Committee. Electric lamps. Mr. H. Fieldhouse, public assistance officer, 11, South Parade, Leeds.

Lithuania.—KOVNO.—March 29. Administration of Posts, Telegraphs and Telephones. Telephone cable, wire, telephone sets and instruments. (A.X. 11715.)*

Manchester.—March 24th. Electricity Committee. Static transformers. (See this issue.)

March 21st. Lamps. (See this issue.)

Marple.—March 11th. Gas and Electricity Department. (*a*) Filling compound for electrical apparatus, and (*b*) ducts. Electricity manager, Gas Works, Morple Bridge, near Stockport.

Northern Ireland.—April 3rd. Electricity Board. L.p. distribution systems. (March 3rd.)

Prestwich.—March 11th. Urban District Council. Electric lamps. U.D.C. surveyor, Town Hall.

Rhondda.—March 25th. Electricity Department. Meters, copper wire, joint boxes, &c. (February 17th.)

Sevenoaks.—March 15th. Rural District Council. Installation of electricity at Isolation Hospital at Otford. (February 24th.)

Shoreham.—Urban District Council. Wiring, &c., at Council houses at Kingston-by-Sea.

South Africa.—CAPETOWN.—March 29th. Electricity Department. Overhead line equipment, including street-lighting fittings (G.X. 12336)*; 1,000 tubular steel poles and fittings (G.X. 12339)*; and ironclad service cut-outs (A.X. 11710).*

Tynemouth.—April 3rd. Electricity Department. Voltage regulator and 200-kW mercury rectifier. (See this issue.)

Warrington.—March 20th. Electricity Department. E.h.p. sub-station switchgear and hot water circulator. (See this issue.)

Whitby.—March 21st. Electricity Department. Electrical materials. (See this issue.)

Willesden.—Electricity Department. Cables. (February 24th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aldershot.—Town Council. Accepted. Wiring twenty-four houses at Aldershot Park for electric lighting (£125.)—A. Snelgrove.

Barking.—Electricity Committee. Recommended. 250-kVA transformer (£144).—Metropolitan-Vickers Electrical Co., Ltd. Cable (£1,561).—Metropolitan Electric Cable Co., Ltd. Switchboard alterations (£536).—Ferguson, Pailin, Ltd.

Cheltenham.—Highways Committee. Recommended. Electric lighting fittings for twelve months.—L. Andrews & Co.; Sharpe & Fisher, Ltd.; Siemens Electric Lamps & Supplies, Ltd.

Derby.—Electricity Committee. Accepted. Evaporator (£2,097).—Aiton & Co., Ltd.

Durham.—County Council. Accepted. Installation of electric lighting in the Willington Police Station.—Alfred White Electrical Co. (1931), Ltd.

East Ham.—Cleansing Committee. Recommended. Electric baling machine (£210).—Shirtliff Bros., Ltd.

Epsom.—Electricity Department. Accepted. Kiosk and transformers (£621).—Crompton Parkinson, Ltd.

Gillingham.—Electricity Committee. Recommended. Disconnecting boxes.—W. T. Henley's Telegraph Works Co., Ltd.

Glasgow.—Housing Committee. Accepted. Electrical work at Nitshill housing estate (£997).—D. Henderson.

Electricity Committee. Recommended. Four static condensers (£1,228).—Telegraph Condenser Co.

Isle of Man.—Electricity Board. Accepted. L.p. distributing cable.—John Collier & Co., Ltd.

Leicester.—Electricity Committee. Recommended. Preheater equipment at central station (£3,645).—J. Howden & Co.

Manchester.—Rivers Committee. Accepted. Electric gear for loading steamships.—John Wolstenholme & Son, Ltd. Overhead electricity line at steamship jetty.—Callender's Cable & Construction Co., Ltd.

Electricity Committee. Accepted. Weldless steel lamp columns and fittings for six months.—Bromford Tube Co., Ltd.; British Mannesmann Tube Co., Ltd. Twenty-ton weighbridge.—Wm. Hodgson & Sons, Ltd.

Public Health Committee. Accepted. Electrically controlled fire alarm.—Carter & Co., Ltd.

Seaham Harbour.—Electricity Committee. Recommended. Supplying and laying cable in Dene House Road (£774).—W. T. Henley's Telegraph Works Co., Ltd.

Stone (Staffs).—Urban District Council. Accepted. Cable extensions to Walton (£315).—Callender's Cable & Construction Co., Ltd.

Sunderland.—Corporation Transport Committee. Accepted. Nine new tramcar bodies (£1,000 each).—English Electric Co., Ltd.

Tynemouth Town Council.—Accepted. Cable (£390).—Macintosh Cable Co., Ltd.

Wimbledon.—Electricity Committee. Accepted. Transformers.—Foster Engineering Co. (£630); Hackbridge Electric Construction Co. (£780). Switchgear.—A. Reyrolle & Co., Ltd. (£1,109); English Electric Co., Ltd. (£379); George Ellison, Ltd. (£731).

Forthcoming Events

Birmingham Electric Club.—Friday, March 10th. Grand Hotel, Birmingham. 7 p.m. Annual dinner.

Institution of Electrical Engineers.—Monday, March 13th. Institution, London. 7 p.m. Discussion on "Will Oil Switches be Superseded?" (*North-Eastern Students' Section*).—Friday, March 10th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. "The Design and Economics of Transformers for Rural Electrification." Mr. E. C. Rippon. (*North Midland Centre*).—Friday, March 10th. Hotel Metropole, Leeds. 7 for 7.30 p.m. Annual dinner. (*North-Eastern Centre*).—Monday, March 13th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Ionisation in Cable Dielectrics." Mr. P. Dunsheath. (*North-Western Centre*).—Tuesday, March 14th. Engineers' Club, Manchester. 7 p.m. Mr. Dunsheath's paper. (*Scottish Centre*).—Tuesday, March 14th. Institution of Engineers and Shipbuilders in Scotland, Glasgow. 7.30 p.m. "The Grampian Electricity Supply Co.'s Hydro-Electric Developments in the Highlands of Scotland." Messrs. A. S. Valentine, H. M. Gibb, and E. M. Bergstrom. (*South Midland Students' Section*).—Tuesday, March 14th. University, Birmingham. 7 p.m. Short Papers. (*North Midland Students' Section*).—Tuesday, March 14th. Hotel Metropole, Leeds. 7.15 p.m. Address by Mr. R. M. Longman. (*Sheffield Sub-Centre*).—Wednesday, March 15th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "Electricity in Mines." Mr. A. R. Cooper. (*London Students' Section*).—Friday, March 10th. Instn, Ldn. 6.15 p.m. "Turbo-Electric Marine Propulsion." Mr. H. W. Beara. Wednesday, March 15th. 3 p.m. Visit to Messrs. Fraser & Chalmers' Engineering Works, Erith. (*Meter and Instrument Section*).—Friday, March 17th. Instn, Ldn. 7 p.m. Informal discussion. (*Sheffield Students' Section*).—Friday, March 17th. University, Sheffield. 8 p.m. "The Future for Electrical Engineers." Prof. E. W. Marchant.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, March 14th. Junior Institution of Engineers. 7.15 p.m. "Supervisory Control Gear." *Kent Sec-*

tion).—Saturday, March 18th. Co-operative Hall, Gravesend. 6 for 6.30 p.m. Annual dinner and dance.

Illuminating Engineering Society.—Tuesday, March 14th. Institution of Mechanical Engineers, London. 7 p.m. "Progress in Illuminating Engineering Abroad." Dr. Ing. N. A. Halbertsma.

Rugby Engineering Society.—Tuesday, March 14th. Rugby. "Foreign Standards and Regulations in the Light of Electrical Engineering Practice." Dr. P. F. Stritzl.

Overhead Lines Association.—Wednesday, March 15th. Institution of Electrical Engineers, London. 5.30 p.m. "Systems of Distribution in Rural Areas," by Messrs. W. Fennell, R. J. J. Swan and W. A. Turnbull. "Voltage Regulation in Rural Distribution," by Mr. E. T. Norris.

Edinburgh Electrical Society.—Wednesday, March 15th. Philosophical Institution, Edinburgh. 8 p.m. Annual meeting.

British Electrical Development Association.—Friday, March 17th. Savoy Hotel, W.C. 12.45 for 1 p.m. Annual luncheon. 3 p.m. Annual meeting.

Batti-Wallahs' Society.—Friday, March 17th. Hotel Metropole, W.C. Annual dinner and dance.

Electrical Association for Women.—Friday, March 17th. Dorchester Hotel, W. 9 p.m. Ball.

Physical Society.—Friday, March 17th. Imperial College of Science and Technology, S. Kensington. 5 p.m. Annual meeting.

Association of Mining Electrical Engineers.—Saturday, March 18th. Newport. 6 p.m. "Some Comparative Notes on Pumping." Mr. S. B. Haslam.

Notes

High-speed Electric Locomotives

Six large locomotives which have just been built by the Constructions Electriques de France for the Midi Railway are the outcome of eight years' experience with the 2,100 h.p. express locomotives on that line. These tractors have service speeds up to 81 m p.h. and a maximum safe speed of 90 m.p.h. On the one-hour rating their capacity is 3,200 h.p., which provides an ample margin for the haulage of the 650-ton loads now found on the "Sud Express" and "Bounding Basque" trains, whose schedules call for start-to-stop speeds of over 56 m.p.h. for distances in excess of a hundred miles.

The line current of 1,500 V d.c. is collected by two pneumatically operated pantagraphs, and is led directly to four double motors, the two armatures of each motor being permanently connected in series. The drive to the wheels is effected through a quill of the normal type, which, in order to obviate torsional stresses, is driven by pinions on each end of the armature shaft. The cushioning springs are arranged outside the wheels, as in the Westinghouse and Sécheron drives. On the hourly rating the motors deliver a tractive effort at the wheel treads of 23,000 lb. at 50 m.p.h. with full field, or 16,200 lb. at 74 m.p.h. with reduced motor fields, the maximum starting effort being 42,000 lb. at 25 per cent. adhesion. Each of the eight armatures has a capacity of 400 h.p. on the one-hour rating, and 375 h.p. on the continuous rating, forced ventilation being employed in each instance. The principal dimensions are: driving wheels, 5 ft. 9 in. dia.; rigid wheelbase, 20 ft. 8 in.; total wheelbase, 45 ft. 5 in.; maximum axle load, 18.7 tons; adhesion weight, 74.5 tons; total weight, 120 tons.

The Electrical Association for Women

The first conference of the E.A.W. in the South-Western area was held recently at Torquay. The Mayor officially welcomed the delegates and Lady Brooke presided. Lady Westmorland presented a paper on "Decoration and Electricity" and Sir John Brooke dealt with "Rural Electrification" in the afternoon. At a meeting which followed it was decided to form a Devon and Cornwall Federation, similar to the one in Yorkshire.

A joint meeting of the Yorkshire County Federation of branches of the E.A.W. and of the Yorkshire Federation of Women's Institutes, was held at Harrogate Winter Gardens on Saturday to hear an address by Mr. W. B. Woodhouse, chief engineer of the Yorkshire Electric Power Co., on "The Uses of Electricity in Rural Areas." Miss Amy K. Hamilton, Secretary of the Women's Institutes Federation, presided. The gathering included Mrs. Woodhouse, president of the County Federation of the E.A.W.; Mrs. Thompson, executive chairman; Miss Caroline Haslett, director of the E.A.W.; Miss Hazel Crompton, daughter of Col. R. E. Crompton; Alderman H. Polland, chairman of the Harrogate Corporation Electricity Committee; and Mr. Neil McLean, Harrogate borough electrical engineer.

E.P.E.A. West Yorkshire Dinner

The tenth annual dinner and dance of the West Yorkshire Section of the Electrical Power Engineers' Association took place on March 4th, at the Hotel Metropole, Leeds, when Mr. R. McCourt (chief assistant engineer, Harrogate Electricity Department) presided over a gathering of some 150 members and ladies. The only toasts, following that of "The King," were "The Association" and "The Ladies and Guests," and speeches were kept down to the minimum in order that there should be a long evening of dancing.

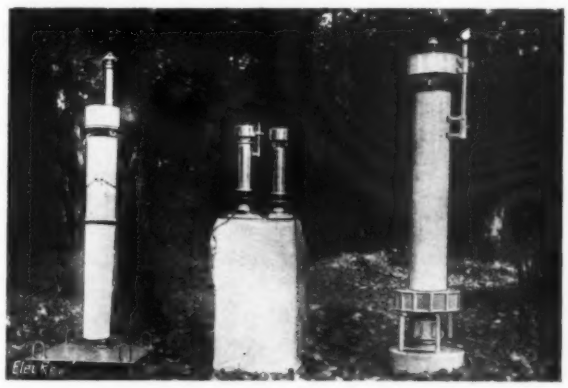
The chairman offered a special welcome to their chief guest of the evening, Miss C. Haslett, director of the Electrical Association for Women. He said that although progress had been made, they were really as yet only just touching the fringe of the domestic source of business. There were 11¼ million homes in Great Britain. Of these only 4¼ million were wired for electricity, and of the 4¼ million only about 40 per cent. were as yet using electricity for purposes other than lighting.

Miss Haslett, proposing the toast of the "E.P.E.A.," said that one of the first things they should do as individuals should be to take their own medicine; there should not be an electrical man's home anywhere that was other than an all-electric home.

Mr. D. J. Duffy, president of the Association, responding, remarked that the grid meant the gradual closing down of many generating stations, as result of which a large number of station engineers would become redundant so far as concerned that phase of service. As President of the E.P.E.A. he made a strong appeal to employers to do their level best to absorb these men into the distribution and selling side instead of casting them into the ranks of the unemployed. The toast to "The Ladies and Guests," proposed by Mr. H. P. Wadsworth (Huddersfield), was responded to by Mr. A. L. Lunn.

An Electric Mosquito Trap

We learn that a French lady has recently invented a device for catching mosquitoes. It embodies a lamp which emits ultra-violet rays to attract the insects, and a powerful electric fan which creates a strong draught and draws the mosquitoes



Mosquito-trapping apparatus

into a receptacle from which they cannot escape. The trap on the left of the illustration is for use in the garden, the centre one is for indoor use, and the one on the right is for large scale use and is effective over many acres. Tests were applied in the Rhône valley recently, and it is reported that during three weeks 150,000,000 insects were caught, although the method of counting them is not stated.

Appointments Vacant

Engineer and manager to take charge of the distribution system for Kirkcudbright County Council.

Chief electrical engineer for Mosul Electricity Supply, Iraq.

Temporary junior mains assistant for Barking Electricity Department.

(See our classified advertisements.)

Fatality

At an inquest held at the Thorncliffe Iron Works, Chapeltown (near Sheffield) on March 2nd, on Horace G. Denton (31), who was killed while working with a coal-cutting machine at the Thorncliffe Colliery, a theory was advanced that his death, through an electric shock, was due to rats having gnawed the trailing cable. A verdict was returned that Denton was accidentally killed by electric shock due to the defective trailing cable of a coal-cutting machine. The Coroner said that there was no evidence as to the cause of the defect.

A Lecture on Batteries

Mr. J. N. Southern, of the D.P. Battery Co., Ltd., is to deliver a lecture on "The Lead Storage Battery" at a meeting of the Guild of British Kinema Projectionists and Technicians at Leeds on March 12th.

The Batti-Wallahs' Ball

Mr. M. Whitgift tells us that all the tickets for the Batti-Wallahs' annual ball on March 17th have been sold.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

GLYDER electric iron.

CLIMAX horizontal pump.

Electrical machine for testing and recording vibrations in high-speed engines (petrol, oil, &c).

BROADBENT sign letters.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. B. Finlay has been appointed constructional engineer by the Glasgow Corporation Transport Department at a salary of £600 per annum. Mr. Finlay has been in the service of the Department for nine years.

Mr. C. G. Abbey, who, as reported in our "Business Notes" in this issue, is the president and general manager of the newly formed United Electrical Engineers, Ltd., of Montreal, was appointed president and general manager of the Lancashire Dynamo and Motor Co., of Canada, Ltd., in 1926, and prior to this appointment had been associated with the parent company, the Lancashire Dynamo & Motor Co., Ltd., for fifteen years. He spent some time at the company's Trafford Park works, and later joined the staff of the Glasgow agents of the company, Messrs. Kelsall & Parsons.

Mr. C. G. Abbey

Mr. E. H. F. Reeves has been appointed to the board of the Electric Construction Co., Ltd.

Col. R. E. Crompton has been recommended by the Council for election into the Royal Society.

Mr. H. V. Henniker, A.M.I.E.E., has been appointed representative for the whole of Scotland for the Transmission Lines & Cables Construction Co., of Keighley. His address is 172, Craigleith Road, Edinburgh. (Telephone: Edinburgh 22684.)

Mr. N. C. Bridge, M.I.E.E., consulting engineer, Glasgow, has been nominated as chairman, and **Prof. F. G. Bailey,** M.I.E.E., Professor of Electrical Engineering, Edinburgh, as vice-chairman, by the Committee of the Scottish Centre of the Institution of Electrical Engineers, to fill the vacancies which will occur on the Committee on September 30th next.

Mr. E. J. Nicholls, electrical engineer to the York City Council, is to have his salary increased from £900 to £1,200 per annum by three annual instalments of £100. When the matter was referred to in open Council an amendment was put forward limiting the increase to £1,000, while others suggested that the time was not opportune for increasing the salary, and if the concern was flourishing it was time electricity was sold at a lower price to consumers. Ald. C. W. Shipley, chairman of the Electricity Committee, said that all the staff of the electricity undertaking were on a scale except Mr. Nicholls, whose scale salary should be £1,600. York's electricity was almost the cheapest in the country, and the undertaking was not only self-supporting, but had contributed £25,000 to the rates in the last five years. All the amendments were defeated, and the proposed increase to £1,200 was agreed to.

Lady Ramsden has been elected president of the Bradford and District branch of the Electrical Association for Women in place of Lady Watson, who has resigned.

Mr. T. W. Heather

Mr. T. W. Heather, who has been appointed sales manager of the General Electric Co., Ltd., to fill the vacancy caused by the death of Mr. H. V. Wynne Roberts, joined the company at the end of 1913 in the Audit Department, and on returning after the war he became assistant manager of the Publicity Department. For the past eight years he has been personal assistant to Mr. M. J. Railing, joint managing director of the company. Mr. Heather's work during the past few years has brought him into the closest touch with all sections of the company and with many outside electrical organisations. He enters upon his new work assured of the regard of all ranks among the company's personnel. He has always taken a keen interest in the social affairs of the company, and photography, golf, and wireless are his hobbies. During the war Mr. Heather served with the 1st Middlesex Regiment and on the General Staff, retiring with the rank of captain. His decorations include the M.C. and bar and he was mentioned in despatches.

Mr. R. W. Southgate, of the Z Electric Lamp and Supplies Co., Ltd., has been transferred from the company's Manchester branch to represent it in the Eastern Counties.

Mr. W. Reay, who has been connected with the Contract office at Lisburn of W. T. Henley's Telegraph Works Co., Ltd., since 1928, has been appointed manager of the company's Belfast branch in succession to the late Mr. C. Magee.

Mr. James Neill, who is at present engineer in charge of the Lerwick generating station, has been appointed engineer and manager of the electricity works in succession to **Mr. G. O. Smith,** who has resigned. Mr. Neill formerly held an appointment at Lossiemouth.

Mr. R. H. Grosvenor has been appointed manager of the three depôts in Surbiton of the Lankester Engineering Co., Ltd., consequent upon the reorganisation of the business. Mr. Grosvenor has been in charge of the company's repair works for several years.

Mr. Arthur Scott, executive engineer, Post Office Telephones, Glasgow, retired on Feb. 17 after many years' service in the P.O. engineering department. He had had the control of many important developments, including the inauguration of the Glasgow repeater station.

Mr. F. North, who is on the staff of the Batley Corporation electricity works, was married at Purston on February 20th to Miss Ivy Bullock, of Featherstone.

Mr. R. L. Brown has been appointed managing director of Messrs. Hopkinsons, Ltd.

Obituary

Herr L. Stark.—The death is reported from Budapest, at the age of 66 years, of Herr Ing. Leopoldo Stark, a leading Hungarian electrical engineer and vice-president of the Electrotechnical Association of Hungary. The deceased was for many years connected with Ganz & Co., of Budapest.

Mr. G. W. Malcolm.—The death occurred on March 4th, at Davenham House, Northwich, Cheshire, of Mr. George William Malcolm, M.B.E., M.I.E.E., M.I.Mech.E., at the age of sixty-two years. The funeral took place on Tuesday last at Davenham. Mr. Malcolm, after his training as a mechanical engineer, entered the service of the Pacific Steam Navigation Co. For nine years he was engaged in engineering in Mauritius. In 1907 he became the chief engineer to the Salt Union, Ltd., and was appointed joint managing director in 1913. As chief engineer of the company he originated the supply of electricity as a by-product of salt manufacturing, and for this purpose the Mersey Power Co. was formed in 1911. At the time of his death he was chairman and managing director of the Mersey Power Co., a director of the British Power and Light Corporation (1929), Ltd., chairman of the North Wales Power Co., and a director of the Electrical Distribution of North Wales and District. He was connected with numerous councils, federations, and boards connected with the chemical and other industries.

[Vandyk Studios

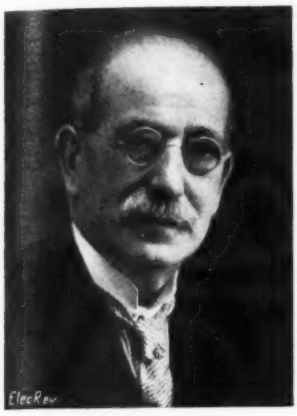
The late Mr. G. W. Malcolm

Mr. W. Redman.—The death is announced at the age of 66 of Mr. William Redman, a former manager of the Shipley (Yorks) electricity works, who had lived at Morecambe since his retirement on superannuation in 1931. He was in the service of the Shipley Urban District Council for thirty-one years. He became assistant manager of the electricity undertaking in 1909, and he was promoted to the post of manager in 1912. When the Shipley Council began to take its electricity supply from the Yorkshire Electric Power Co. in 1927, Mr. Redman was placed in charge of the sales and distribution side of the Shipley undertaking, an appointment which he held until his retirement.

Monsieur C. David.—The death recently occurred in Paris, at the age of 58 years, of M. Charles David, a well-known French electrical engineer. The deceased was for many years connected with the Laboratoire Centrale d'Electricité in Paris,

where he carried out some valuable research work on the heating of electric cables.

Mr. W. McWhirter.—Mr. William McWhirter, M.I.E.E., one of the pioneers of the electrical industry in this country, died in his eighty-second year at Clarkston, Glasgow, on March 6th. He was the inventor of the first indicating voltmeter and ammeter patented in 1882, and among his inventions were electrical water-level indicators and recorders, magnetic-shielded voltmeters and ammeters, and other scientific and electrical instruments. Mr. McWhirter was apprenticed to his uncle in the bakery and confectionary business, but he spent all his leisure experimenting in electrical science. He joined the telegraphic department of the Glasgow and South-Western Railway, and soon attained the position of divisional inspector. From there he went to the Barrow and Furness Railway as a telegraphic superintendent. In association with the firm of Messrs. Norman & Sons (later Messrs. Claud Hamilton & Co.) he was responsible for one of the earliest installations of dock lighting by means of arc lamps at Barrow. In 1882 he returned to Glasgow to open a branch establishment for Messrs. Norman & Sons, and was responsible for the first electric lighting installation at the Central Station. About two years later the firm of McWhirter & Co. was started, and later on the Faraday electrical engineering works were opened in Govan, where during this period some outstanding improvements were made in the efficiency and commutation of the dynamo. In 1897 the present company of Wm. McWhirter & Sons was founded. Mr. McWhirter was a member of the British Association, the Astronomical Society, the Philosophical Society, and other learned bodies. He was one of the oldest members of the Institution of Electrical Engineers (1880), and was chairman of the Scottish Centre in 1912-13. He was also one of the founders of the E.C.A. of Scotland. In the course of his electrical researches Mr. McWhirter co-operated, amongst others, with the late Professor Silvanus Thompson, Professor Andrew Jamieson, and Professors Sprague, Ayrton, and Perry. Amongst his other early associates were Sir Hugo Hirst, Bt., chairman of the G.E.C.; Col. R. E. Crompton; and Professor Alfred Hay.



The late Mr. W. McWhirter

Mr. W. W. Blunt.—The death occurred on February 25th of Mr. W. W. Blunt, who was for some years prominently connected with the Metropolitan-Vickers Electrical Co., Ltd. Mr. Blunt graduated from Lehigh University in 1892, and later joined the Westinghouse Company at Pittsburg, reporting upon various railway, tramway and other schemes in Peru and Chile. In 1898 he came to London as an engineer for the Westinghouse Electric Co., Ltd. When the British Westinghouse Electric and Manufacturing Co. was formed he was appointed assistant sales manager, and later sales manager, being subsequently elected to the board. During the period covered by these offices he made many friends in this country. He resigned his position in 1919 in order to join his brother in a foundry business at Port Huron and Michigan. Mr. Blunt leaves a wife, two sons and a daughter.

The late Mr. W. W. Blunt

Mr. H. W. Handcock.—The death of Mr. Henry William Handcock occurred on February 10th, in Guernsey, at the age of sixty-five. Mr. Handcock commenced his electrical career as chief electrical engineer in the Merchant Service, and in 1891 joined the staff of Messrs. Cundall & Schultz, consulting engineers, who were engaged in laying out electrical plant for mills in Russia. He visited St. Petersburg and acted as resident engineer in connection with the erection of various electrical plants. He became a partner with Mr. J. H. Cundall in 1893, and a year later set up in practice on his own account as a consulting engineer. Two years later he was joined by Mr. A. H. Dykes, and the partnership continued until 1921, when Mr. Handcock retired. The firm was responsible for many engineering projects, especially matters relating to traction and electricity supply undertakings. In 1908 Mr. Handcock, in conjunction with Mr. Dykes, did a great deal in connection with the foundation of the Association of Consulting Engineers. He was a member of the Institutions of Electrical and Civil Engineers. Mr. Handcock leaves a widow and a daughter.

Will.—The late **Mr. W. C. Ullmann**, a former borough electrical engineer of East Ham, left £12,110 (net personalty £10,966).

Insulation Manufacture

THE adoption by George Ellison, Ltd., of a synthetic resin varnished paper insulation for their switchgear, and the advisability of controlling the manufacture to ensure reliability of the material, led to the establishment of Ellison Insulators, Ltd., who produce "Tufnol" in a modern factory adjacent to the works of the parent company at Birmingham.

The basis of the material is paper; this is received in rolls several feet wide, and is passed through preliminary drying chambers before being impregnated with varnish. In the same sequence of operations the treated paper is passed by a circuitous route through secondary drying ovens before being re-rolled.

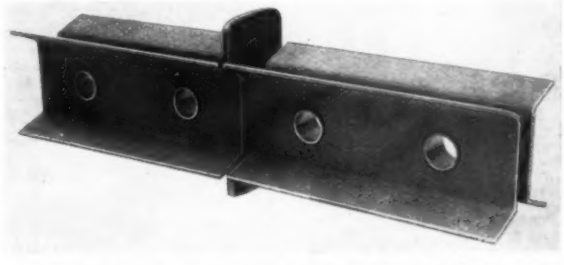
Various qualities of paper are used for different grades of insulation, and fabric and asbestos paper are treated in the same way for the production of special material. For instance, gear wheels are produced from the fabric material, while asbestos paper affords an insulation highly resistant to heat.

For insulator tubes treated paper is wound on a mandrel between three electrically heated rollers. While still on the mandrel the material is subjected to heat and pressure in split moulds with very accurate linings in hydraulic presses. After this treatment the mandrel is withdrawn. Sheets of the same material up to 3 in. thick and 4 ft. square are produced in similar presses with suitable moulds.

Disintegrated treated paper is used for moulded work for such products as overhead line insulators and plug discs, while from synthetic resin powder we saw such articles as contact plates for Ellison "Bantam" circuit breakers and tramway overhead-line bolts being produced. It is claimed that mouldings produced from the disintegrated paper are half as strong again as those produced from untreated paper.

To us the machine shop of this works appeared like a carpenter's shop. Sanding machines, saw mills, and lathes, &c., all deal with the material as if it were wood. Rectangular bobbins were seen being produced from shaped sectional tube with end pieces half mortised and glued on. There is a special punching grade of "Tufnol" from which we witnessed the production of all manner of switch parts, &c. The gear wheels produced include very tiny ones for electric clocks, and some up to several inches wide.

The latest use to which "Tufnol" has been put is for sectionalising track circuiting insulators. At the rail joint there are two fabric "Tufnol" plates moulded to the shape of the fish plate on either side with "Tufnol" tubular bushes for the bolt holes. A paper base plate cut to the shape of the rail section is inserted between the rail ends. This arrangement is illustrated.



"Tufnol" railway track circuit sectionalising insulation for the Great Western Railway

Expansion Circuit Breakers in Germany

What is stated to be the first installation of expansion-type circuit breakers to work at 100,000 V has recently been completed by the Siemens-Schuckert Co., of Berlin, at the outdoor transforming station of the Groba Elektricitäts Verband at Groditz, near Riesa, Saxony.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrieal Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Mainud Starter, Ltd.—Private company. Registered March 2nd. Capital, £1,000 in 700 ordinary shares of £1 each and 6,000 deferred shares of 1s. each. Objects: To acquire any invention relating to the starting of internal combustion engines, by the use of current from an external electric supply; to adopt an agreement with H. O. Burge, L. H. D. Jones and E. D. Jones; and to carry on the business of electricians, electrical engineers, &c. The permanent directors are: H. O. Burge, "Martins," Crossways, Shenfield, Essex; L. H. D. Jones, Old Basing, Alwyne Avenue, Shenfield; and Ewart D. Jones, M.I.M.T., 2, Blue Bridge Road, Brookmans Park. Registered office: 53, New Broad Street, E.C.2.

S. G. Brown (Foreign & Colonial), Ltd.—Private company. Registered March 2nd. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio instruments and components, &c. The directors are: T. B. Hooghoudt, 9, Nieuwe Gracht, Haarlem, Holland; A. W. J. Cordrey, 99, King Henry's Road, N.W.3; W. A. Hunt, 11, Alexander Place, S.W.7; and Mrs. Alice S. G. Brown, 67, North Gate, Regent's Park, N.W.8. Registered office: 15 & 16, Alfred Place, Tottenham Court Road, W.C.1.

Electric Clocks, Ltd.—Private company. Registered in Edinburgh on March 1st. Capital, £500 in £1 shares. Objects: To carry on the business of dealers in and manufacturers of electric clocks, vacuum cleaners, fires, radiators and all kinds of electrical appliances, &c. The directors are: W. B. Stewart, 80, Holmlea Road, Glasgow, S.2, and J. G. Brown, 32, Maryland Drive, Glasgow, S.W.2. Registered office: 125, Buchanan Street, Glasgow.

Campbell Short Wave Wireless, Ltd.—Private company. Registered March 6th. Capital, £1,500 in 500 6 per cent. cumulative preference and 1,000 ordinary shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in electrical accumulators and batteries, wireless components, &c. The subscribers are: A. W. Pears, 6, Colchester Avenue, Manor Park, E.12; and Celia F. Sanders, 41, Maberley Road, Upper Norwood, S.E.19. Registered office: 4, London Wall Avenue, E.C.2.

Radio & Electrical Supplies (Western), Ltd.—Private company. Registered March 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in electric, gas and oil lamps, quartz lamps, reflectors, bells, fires, stoves and cookers, radio and electrical engineers, &c. The directors are: W. Jones (permanent managing director) and Mrs. M. E. Jones, both of 21, Station Road, Llanelly. Solicitors: Jennings & Williams, Cowell Street, Llanelly.

Wood Electric Manufacturing Co., Ltd.—Private company. Registered March 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light, &c. The permanent directors are: Lt.-Col. H. C. Stevens, Lambourne House, Bagshot, Surrey; and J. M. T. Denny, 11, Beaufort Gardens, S.W.3. Registered office: Oaklands Road, Cricklewood.

A. Vandam & Co. (1933), Ltd.—Private company. Registered March 2nd. Capital, £6,000 in £1 shares (4,000 redeemable preference and 2,000 ordinary). Objects: To acquire the business of importers and exporters of and dealers in electrical and mechanical apparatus, goods and accessories carried on by A. Vandam & Co., Ltd. The first directors are: E. H. Charsley, Bridge House, Bexley; A. W. Scott, 19, Chestnut Road, West Norwood, S.E.27. Registered office: Caxton House, Tothill Street, Westminster, S.W.1.

Returns of Electrical Companies

Naider Bros. & Thompson, Ltd.—Capital, £30,000 in 15,000 preference and 15,000 ordinary shares of £1. Return dated December 21st, 1932. 14,968 preference and 14,849 ordinary shares taken up. £13,881 paid on 12,000 preference and 1,881 ordinary shares, £15,936 considered as paid on the remainder. Mortgages and charges, nil.

Finsbury Radio Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1932. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Shepherd & Co. (Salford), Ltd.—Capital, £500 in £1 shares. Return dated December 2nd, 1932. 478 shares taken up. £239 paid, £239 considered as paid. Mortgages and charges, nil.

Macintosh Cable Co., Ltd.—Satisfaction to the extent of £250,000 on February 15th of first mortgage debenture stock, authorised August 27th, 1930, and registered October 20th, 1930, securing £350,000.

Western Counties Electrical and Engineering Co., Ltd.—Satisfaction to the extent of £3,000 and £350 respectively on February 8th, of mortgages dated September 21st and 23rd, 1929, and registered September 26th, 1929.

Wireless Trading Association, Ltd.—Issue on February 23rd, of £1,000 debentures, part of a series already registered.

Standard Switchgear, Ltd.—Particulars filed of debentures not exceeding £3,000 authorised February 17th, charged on the company's property present and future, including uncalled capital, the amount of the present issue being £3,000.

Baxter & Caunter, Ltd. (old company).—A. A. Lough, 8, Frederick's Place, E.C.2, ceased to act as receiver and manager on February 18th.

Simpsons Electricals, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £11,000. The additional capital is divided into 40,000 deferred shares of 1s. each.

City Notes

The Midland Counties Electric Supply Co., Ltd.—The accounts of this company were abstracted in our last issue (p. 328) and the annual meeting was held on March 6th, when Mr. G. Balfour (chairman), who presided, said the accounts indicated steady progress, notwithstanding the long-delayed industrial revival. The company was registered in December, 1912, as the Tramway Light & Power Co., Ltd. This year, therefore, they "came of age." Regarding their transport undertakings they closed down the last section of the tramway system last year for changing over to trolley-buses. Certain sections of the trolley-bus system were put into operation towards the end of last year and the remaining sections would be in operation in about three months. They had to date written off the traction properties the sum of £168,000, leaving only a moderate amount to be dealt with on the completion of the change-over. The amount invested in transport had now fallen to approximately 10 per cent. of the share and loan capital. Their actual electricity supply area was about 2,200 sq. miles, of which 2,180 sq. miles had a density of population of under 440 per sq. mile. Notwithstanding this low density of population they were able to show a resultant sale price per kWh to the consumer comparing favourably with, and many times beating, the rates in densely populated city areas. The operating companies extended their supplies to two additional urban districts and ninety-two parishes during the year, and supplies were now given in three boroughs, thirty urban districts and 403 parishes. In addition, street lighting facilities were provided in two additional urban districts and ten parishes, street lighting now being provided in two boroughs, fifteen urban districts and eighty-six parishes. Two Special Orders were granted during the year, one for the North Derbyshire area, and the other relating to Hartingdon Upper Quarter and King Sterndale. During the year 149 miles of overhead and nine miles of underground h.p. lines were put into operation, making a total of 1,196 miles, while 134 miles of overhead l.p. lines were erected and sixty-three miles of l.p. underground mains laid, making a total of 1,063 miles. The sales of electricity totalled 213,733,000 kWh, against 175,432,000 kWh in 1931, and the number of consumers increased by 9,673 to 51,533. The additional load connected amounted to 17,132 kW, bringing the total to 180,972 kW. The extensions to the Spondon power station were completed, and the results achieved had come up to their highest expectations.

The Metropolitan Electric Supply Co., Ltd., held its annual meeting on March 7th, when Mr. G. Balfour (chairman), who presided, said the results for the past year were in no small measure achieved owing to bringing under their control isolated undertakings and thus effecting comprehensive co-ordination of operation in their Western area. Reductions had been made during the year in the charges to domestic consumers by the company and its subsidiaries, excluding the London area, amounting to £40,000, and further reductions in price would be made in several districts this year. With regard to electricity tariffs. They found it difficult to get the real merit and value of the two-part tariff understood until consumers actually tried it, and then their experience was that it was welcomed and the consumption of electricity increased. It was a remarkable fact that the average consumption per consumer increased something like four times once the two-part tariff was adopted. Their business-getting department and sales organisation had been specially active during the year. For some considerable time an intensive propaganda campaign had been carried on. They felt satisfied that their organisation was thoroughly fitted to cope with all their propaganda and sales, but they could not have been certain of this without a trial of much-advocated special forms of propaganda and advertising. They were giving effect to a scheme of deferred payment of wiring installations spread over a period of years through a two-part prepayment meter. The sales of electricity last year amounted to 202,085,000 kWh, as compared with 187,279,000 kWh in the preceding year. Of this total 149,222,000 kWh was sold in the Western area and the remainder in the London area.

The Electrical Distribution of Yorkshire, Ltd., held its annual meeting in Leeds on March 7th, Mr. R. W. Wickham presiding. In presenting the report and accounts (ELEC. REV., March 3rd, p. 328) the chairman said that the sales of electricity during the year under review showed an increase of over 14 per cent., as compared with the preceding year, and 7,769 consumers, a record number, had been added during the year. In the past five years the company had connected 35,801 consumers, an average of 7,160 per annum. New agreements continued to be made for the supply of electricity for street lighting which they now provided in thirty-seven urban districts and forty-four rural parishes. A satisfactory feature was that local authorities were requiring much better illumination than was usual a few years ago. The demand for a supply to new housing estates showed no abatement, and there was a growing appreciation of the facilities offered by the company in the hire-purchase of wiring installations. It had been their continuous object to unify the supply throughout their area, and in furtherance of this policy, during 1932 two more non-statutory undertakings were purchased and negotiations were in progress for the purchase of other undertakings. In the last ten years they had expended over £2,069,000 in the provision of distribution mains, sub-stations, &c., and provided they could obtain a reasonable return on the capital expenditure, it was their ambition to supply electricity in every part of the area without regard to the size of the premises to be supplied. By acting in conjunction with other supply authorities they were now able to purchase domestic appliances in bulk at prices which enabled them to supply these for cash or hire-purchase on very attractive terms. As a consequence, notwithstanding the reduction in the demand for electricity for power purposes,

steady progress was being made, principally due to the increasing use of electricity in the home.

The London Electric Supply Corporation, Ltd., held its annual general meeting on Tuesday. Mr. Oliver R. H. Bury (chairman), who presided, referred to the death of Brig.-Gen. the Hon. E. Baring, a director, and the election of Lt.-Col. Sir M. J. Wilson to the board. Reviewing the report and accounts (see our last issue, page 328), the chairman said that the sales of electricity in 1932 amounted to 293,480,406 kWh, an increase of approximately 17¾ million kWh. The change of frequency had engaged a good deal of the corporation's time, and was steadily approaching completion, at least 70 per cent. of the work having now been accomplished. They were unable to say yet whether there would be a "consumers' benefit" for the year 1932. Last year the average consumption of consumers supplied under the all-in domestic tariff was approximately 1,400 kWh, the average price paid by this class of consumer being 1.65d. The success of this tariff led the board to introduce a similar tariff for shop and business premises in September last. Schemes of assisted wiring were under consideration.

The Clyde Valley Electrical Power Co. reports a profit for the year ended December 31st last, of £347,744, as compared with £318,228 in the preceding year, which with £81,658 brought in makes £429,402 available. A sum of £130,000 is transferred to contingency fund, and it is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent. for the year, leaving £84,402 to be carried forward. The report states that the depressed condition of trade in the company's area has continued and is reflected in the receipts. The distribution system has been further developed by an additional thirty-two miles of cable and overhead lines and twenty-one sub-stations. The standardisation of frequency on the system has been completed. The power stations at Yoker and Clyde's Mill have been selected under the Central Scotland Scheme, and are being operated under the control of the Central Electricity Board.

The West Gloucestershire Power Co. reports a balance on revenue account for 1932 of £35,216. This has been disposed of as follows: Depreciation written off motors, £3,397; transferred to depreciation, renewals and obsolescence reserve in respect of 1932, £27,637; transferred to depreciation reserve, £4,182. The deficit of earlier years having been completely cleared off in 1931, the directors consider that it is essential to build up a reserve for depreciation renewals and obsolescence. The sales of electricity amounted to 32,427,985 kWh, an increase of 13.25 per cent. Meeting: March 13th at Gloucester.

The Chiswick Electric Supply Corporation, Ltd., held its annual meeting last week. Mr. H. Kahn (chairman) in the course of his speech said the sales of electricity showed an increase of 6 per cent., while the number of consumers showed an increase of 7 per cent. During the year an additional 1,000-kW motor-convertor had been installed and since January 1st they had been receiving a bulk supply on a much larger scale and on more favourable terms. At Aberystwyth the results for the year were satisfactory.

The Allmänna Svenska Elektriska Aktiebolaget (A.S.E.A.) reports that after the usual writings-off and reservation for taxes there is a net profit for 1932 of 5.19 million kronor against 5.24 millions for 1931. It is proposed to maintain the dividend at 7 per cent. The company this year celebrates its fiftieth anniversary.

The Bournemouth & Poole Electricity Supply Co., Ltd., has recommended a final dividend of 9 per cent., less tax, on the ordinary shares, making 15 per cent. for the year (same).

The Richmond (Surrey) Electric Light & Power Co., Ltd., has declared a final ordinary dividend of 7 per cent., less tax, making 11 per cent. for the year (same).

The Marconi International Marine Communication Co. proposes to pay a final dividend of 2½ per cent., less tax, making the total distribution for the year 7½ per cent. For 1931 the final payment was 5 per cent., making 10 per cent. for the year.

Christy Bros. & Co.—A prospectus was to appear at the end of this week of an issue of 50,000 six per cent. cumulative preference and 50,000 ordinary shares of £1 each. The price in both cases will be 24s. per share. The proceeds will be used in the repayment of a temporary bank loan incurred for the development of the business, for the extension of interests in associated electricity supply companies and for general purposes.

The Isle of Thanet Electric Supply Co., Ltd., reports a revenue for the year ended December 31st last of £168,230, as compared with £169,994 in the preceding year. Working expenses were £97,727 (against £101,575), and after deducting debenture interest, &c., and adding £5,640 brought in, there is a balance of £26,721. It is proposed to pay a final ordinary dividend of 4 per cent. and to carry forward £3,801.

The Lisburn Electric Supply Co. reports a trading profit for 1932 of £3,465. It is proposed to pay a final dividend at the rate of 5 per cent. per annum, making 5 per cent. for the year (same), and to carry forward £1,156.

The Globe Telegraph & Trust Co., Ltd., has announced a quarterly dividend on the ordinary shares of 1s. per share net. A similar payment was made in the previous quarter.

The City of London Electric Lighting Co., Ltd., has declared a final dividend of 1s. per share on the ordinary shares, making 10 per cent. for the year (same).

Stocks and Shares

Tuesday Evening.

THE outstanding subject of the current week is, of course, the financial crisis in the United States, and the effects that have followed from it. To some extent the latter are, to the holder of British securities, surprisingly small. It is rarely that an event of such calamitous consequence happens without its causing repercussion throughout the financial world. Yet the step which the new President took of declaring a virtual moratorium in New York, while it led to suspension of foreign exchange dealings, had little influence on stocks and shares, even in the American list. It laid a heavy hand upon the South African mining shares which lately have been so popular, bringing about falls in the majority of prices. But the lists of British issues remain surprisingly steady.

The tall fluted chimneys of the Battersea power station have added distinction to the south bank of the Thames

Obliquely, the American misfortune is a bull point for British investments. For the last few weeks, money has been coming over here from America in order to secure the safety which cannot be obtained in the United States. Reference was made to this movement last month in these columns. It is not only American money, however, that is absorbing British stocks and shares; the home demand for security is greater than ever. Few companies that have debenture or other obligations which carry higher rates of interest than those at present current, can resist the temptation to pay off existing issues, and substitute stocks at a lower interest. To the individual investor, this is a hard matter, coming, as it does, at a time when business is none too good, and when the prospect of any material relief in taxation seems to be but slender.

Home Electricity Supply

Electric Supply Corporation shares have fallen 3/16 to 3¼, a not unnatural reaction after the sharp rise which the shares recently enjoyed. County of London ordinary fell a florin to 51s. 3d., apparently on vague fears that shares might be realised on behalf of American interests. Notting Hill 6 per cent. preference at 13¼ are 10s. up. Edmundson's preference rose to 30s. 6d. A few of the ordinary shares in this group are quoted ex dividend. As regards the London electricity supply companies' shares, the dividend amount taken off the prices is usually too small to make any notable addition to the yield on the shares. In the market, the possibility is being canvassed of the various London companies' ability to pay 7½ per cent. in respect of the current year, as against the 7 per cent. standard rate for 1932 distributed by those under-

takings to whom the Act applies. It is stated, however, that the companies are not yet able to ascertain with certainty the amount which they will be able to divide between their customers, in the shape of reduced charges, and their shareholders, in the way of increased dividends. No doubt a good deal will depend upon the way in which earnings run during the present year. As to this, every indication points to the likelihood of consumption of electricity being increased in 1933.

Provincial Electricity

The Isle of Thanet Company has declared a dividend of 4 per cent., the same as that paid a year ago, and the price of the shares is steady at 21s. 6d. The 6 per cent. participating preference stand at 27s. 6d., and the company's 4 per cent. debenture stock at 100. Yorkshire Electrics are a little easier at 43s. 3d. The feature of this group is, however, a sharp fall in the prices of West Gloucestershire Power ordinary and preference stocks. The company's report shows an increased revenue of £9,300, but the decision of the directors to build up a reserve for depreciation, renewals and obsolescence instead of distributing the money by way of dividend caused no little disappointment. The ordinary stock fell 10 points to 53, and the preferred, which rose to 103 last month, dropped to 87. The price of the 5½ per cent. first mortgage sinking fund debenture stock is unchanged at 109. Lancashire Light and Power shares eased off to 32s. 6d., North Eastern ordinary to 29s. Midland Counties electric are unchanged at 35s. The chairman pointed out at the meeting on Monday in this week that the company is twenty-one years old this year, but that the intensive development of its area came about only six years ago. Fife Electric ordinary at 2s. 10½d. are a little easier on the week.

Traction Stocks

The outstanding feature in this market is the strength of Metropolitan consolidated. At 67, the price shows a gain of 2½ points, allowing for deduction of the dividend on Monday in this week. It is taken so much for granted at the present time that the London Passenger Transport Bill is certain to become law that business is being done on the expectation that the stocks will shortly be exchanged into the new securities. There is some discussion as to what the prices of these latter should prove to be when dealings start. For the "A" stock, a probable starting quotation of 113 is estimated, but it is in the "B" stock where there is scope for wide divergence of opinion. Some authorities think that 55 will be high enough; others consider that 60 is not an extravagant estimate of what the public are likely to be willing to pay for the security. Dealings in such issues as London United Tramways debenture, to take one example, are taking place with relation to the prices that will prevail of the London Passenger Transport securities, and on the basis just mentioned. It is for this reason that London United Tramway debenture rose 12 points last month. The price holds its gain of 73½, and London and Suburban Traction preference has strengthened to 13s. Metropolitan District has undergone no actual change at 55½, allowing for the dividend deduction, and Underground Electric ordinary shares at 17s. are also ex.

Cables and Wireless

The blow dealt at confidence by the American crisis found a faint reflection in the market for cables and wireless stocks, but the first losses were mostly recovered, and except for a fall of 10s. in Cables "A" preferred ordinary to 27, the trio is hardly affected. Globe Telegraph and Trust ordinary went back to 11½. American Telephone and Telegraph is 5 points higher at 142½, while Internationals at 8 are the same as last week. Consolidated Gas and Electric of Baltimore at 78 shows no change, after its fall of 7 a week ago, and in the Canadian group, Shawinigan Water and Power shares are a point higher at 13¼. The only change in the Mexican issues is a fall of 4 points in Mexico Tramway 5 per cent. bonds, which lowered the price to 41½. Telephone and General Trust 7 per cent. preference shares advanced to 25s. upon the satisfactory report just issued.

Manufacturing and Equipment

Ever-Ready shares fell back to 25s. 9d., showing a loss of 1/16, in spite of the over-subscription of the company's issue of Lissen, Ltd., whose 8 per cent. preference shares were offered, it will be remembered, at 23s. For these Lissen preference there was a rush, but evidently the stags were in too great evidence, because the price opened at a small discount, and went back still further to 13s. 9d. for the shares 15s. paid. The remaining instalment of 8s. per share is due on the 24th of this month. Ever-Ready preference are also easier at 38s. 9d., and Ever-Ready Trusts have declined to 18s. 9d.

Where prices have moved in the market for manufacturing shares, the changes are mostly small falls, but Telegraph Constructions make a pleasant exception, the price moving up to 17s. 6d. on reports that the company is receiving good orders. Callender's are ⅛ down at 2⅞; Henleys are 1/16 easier at 6⅛; Siemens eased off to 26s. 3d.; General Electrics to 40s. 9d. English Electric ordinary are lower at 11s. 3d. Associated Electrical preference at 30s. 9d. are 6d. down. The ordinary shares remain at 17s. 6d.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Mar. 7.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	72/6	—	4 2 8
Brompton Ordinary	1	8½	8½	33/6	—	4 3 7
Central Electricity 4½% Deb. ...	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8½	8½	33/6	—	4 3 7
Chelsea	1	8¾	8¾	33/-	—	4 4 10
City of London	1	10	10	34/6	—	4 1 2
Clyde Valley	1	8	7	35/-	—	4 0 0
County of London	1	11	10½	51/3	−2/-	4 1 10
Edmundsons' 7% Pref.	1	7	7	30/6	+1/-	4 11 10
Elec. Dis. Yorkshire	1	9	9	43/9	—	4 2 2
Elec. Supply Corporation	1	11	11	62/6	−⅛	3 10 3
Kensington Ordinary	1	8	8	33/9	—	4 3 7
Lancs. Light and Power	1	6½	7	32/6	−⅛	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	—	4 3 4
London Electric	1	9	9	33/-	—	4 4 10
Metropolitan	1	10	10	50/-	—	4 0 0
Midland Counties	1	7	7	35/-	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary...	1	6	6	29/0	−6d.	4 2 9
Do. 7% Pref.	1	7	7	32/-	—	4 7 6
Northampton	1	10	10	50/- xd.	−⅛	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	+½	4 10 7
North Met. Elec. 6% Pref. ...	1	6	6	29/6	—	4 1 4
St. James' and Pall Mall	1	8	8	32/6 xd.	—	4 6 2
Scottish Power	1	8	8	35/9	—	4 9 5
South London	1	8½	8½	33/-	—	4 4 10
Urban Ordinary	1	7	7	34/6	—	4 1 2
Westminster Ordinary	1	8½	8½	32/6 xd.	—	4 6 2
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	42/- xd.	−9d.	3 16 2
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	81½	—	4 11 7
Metropolitan	„	3½	2½	67 xd.	+2½	3 2 10
Do. District	„	5	4½	55½ xd.	—	5 8 2
Underground Electric	1	8	7	17/0 xd.	—	5 6 0
Telegraph and Telephones.						
American Tel. & Tel.	$100	9	9	142½	+5	6 6 4
Anglo-Am. Tel. Pref.	Stock	6	6	106	—	5 13 0
Do. Pref.	„	1½	1½	25	—	6 0 0
Cables & Wireless 5½% Pref. ...	„	5½	2¾	82½	—	3 7 6
Do. A 7½% Ord.	„	—	Nil	27	−½	—
Do. B Ord.	„	—	Nil	11	—	—
Globe Tel. and T. Ord.	10	8½	Nil	11½	+½	—
Do. do. Pref.	10	6	6	11¾	—	5 1 2
Great Northern Tel. ...	10	20	20	27½	—	7 5 6
Marconi-Marine	1	15	10	33/3	−6d.	6 0 4
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref. ...	5	—	—	1/9	—	—
Do. do. 2nd Pref.	5	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	6	—	—
British Electric Traction Def. Ord.	„	5	5	235	—	—
Do. do. Pref. Ord.... ...	„	8	8	136	—	5 17 8
Brazil Traction	100	—	—	9½	—	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	13/-	+6d.	—
London United Tram Deb. ...	Stock	4	4	73½	—	5 8 10
Mexico Trams, 5% Bonds... ...	—	5	5	41½	−¼	12 1 0
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	74½	—	6 14 3
Victoria Falls Ord.	1	15	15	74	−⅛	3 15 0
Yorkshire (West Riding)	1	Nil	Nil	5/6	—	—
Manufacturing Companies.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/9	−6d.	5 4 1
Babcock & Wilcox	1	14	14	36/6	−1/-	—
British Aluminium Ord.	1	10	5	25/-	—	4 0 0
British Insulated Ord.	1	15	15	67/6	—	4 8 4
Brush Ord.	Stock	5	Nil	50	—	—
Callender's	1	15	15	2⅞	−⅛	5 4 4
Do. 6½% Pref.	1	6½	6½	28/3	—	4 12 0
Crompton Parkinson Ord.... ...	5/-	30	24	22/6	—	5 0 0
Do. 8% Pref.	1	8	8	30/-	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	12/-	—	—
Enfield Cable Ord.	1	25	25	4⅝	—	5 8 1
English Electric	1	Nil	Nil	11/3	−⅛	—
Do. do. Pref.	1	Nil	Nil	15/6	—	—
Ever Ready	5/-	35	35	25/9	−⅛	6 16 0
Ferranti Pref.	1	7	7	24/-	—	5 18 0
G.E.C. Pref....	1	6½	6½	29/6	—	4 8 2
Do. Ord....	1	10	8	40/9	−⅛	3 18 5
Henley's	1	30	30	6½	−⅛	4 17 10
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	26/3	−9d.	5 14 3
Telegraph Construction	£1	Nil	Nil	17/6	+⅛	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931.

13353. "Band-pass tuning circuits for wireless signalling." Dubilier Condenser Co. (1925), Ltd. May 10th, 1930. (387683.)

19944. "Apparatus for use in electrically stunning animals to be slaughtered, and a method of using the same." J. Schmidt and Industrial Waste Eliminators, Ltd. July 10th, 1931. (387691.)

22295. "Lightning arrestors." British Thomson-Houston Co., Ltd. August 6th, 1930. (Addition to 344032.) (387696.)

22296. "Electric high-frequency generators." British Thomson-Houston Co., Ltd. August 27th, 1930. (387697.)

22331. "Aerials or antennæ." H. Lassman, F. A. Hutson, and New London Electron Works, Ltd. August 6th, 1931. (387698.)

22407. "Permanent-magnet loudspeakers." Magnavox Co. May 18th, 1931. (387673.)

22633. "Electric fans, ventilators, and the like." B. C. Bennett. August 10th, 1931. (387704.)

22792. "Electric welding." British Thomson-Houston Co., Ltd. August 12th, 1930. (387714.)

22794. "Portable high-frequency signalling apparatus." C. Lorenz Akt.-Ges. March 6th, 1931. (387715.)

22925. "Electrical power systems comprising storage batteries." Electrical Research Products, Inc. August 13th, 1930. (387723.)

25744. "Insulating materials." International General Electric Co., Inc. September 15th, 1930. (387744.)

26455. "Automatic screw-plug switches or cut-outs." Stotz-Kontakt Ges. September 22nd, 1930. (387750.)

26788. "Telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. September 25th, 1931. (387753.)

27360. "Welding electrodes and methods of making the same." British Thomson-Houston Co., Ltd. October 1st, 1930. (387757.)

27539. "Electric accumulators." C. Aus Der Au. October 4th, 1930. (387759.)

28003. "Transformers for use at high potentials." Siemens & Halske Akt.-Ges. October 21st, 1930. (387762.)

30,993. "Electrically heated irons for domestic use." E. Gill and R. J. Evans. November 9th, 1931. (387779.)

31355. "Mounting arrangements for electromagnetic-stepping switches." Siemens Bros. & Co., Ltd., and F. Baker. November 12th, 1931. (387780.)

32309. "Electric contact devices." W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze. November 21st, 1931. (387788.)

32849. "Electric cables." Pirelli-General Cable Works, Ltd., and G. Martinez. November 26th, 1931. (387789.)

33018. "Switches for controlling alternating current circuits." Igranic Electric Co., Ltd., and S. R. Wright. November 28th, 1931. (387792.)

33396. "Alternating current generators incorporating discharge tubes." L. E. Ryall. December 2nd, 1931. (Cognate application 2589/32.) (387796.)

34601. "Sockets and plugs used for electrical connections." L. H. Reid. December 14th, 1931. (387802.)

35236. "Time-recorder for use in connection with electrical tramway, railway, and like systems." A. H. Gledhill. December 21st, 1931. (387808.)

35445. "Depolarising electrodes for electric batteries." Soc. Anon. le Carbone. February 28th, 1931. (387809.)

1932

319. "Arrangements for the suppression of the harmonics in the magnetising current of saturated choking coils or transformers." Siemens-Schuckertwerke Akt.-Ges. August 3rd, 1931. (387815.)

2354. "Mounting of electric terminals." Siemens Bros. & Co., Ltd., and F. J. Gee. January 26th, 1932. (387831.)

3346. "Brakes for electric motors." English Electric Co., Ltd., and G. Dickinson. February 4th, 1932. (387837.)

9002. "Ignition magnetos for internal combustion engines." Soc. des Moteurs Salmson. March 31st, 1931. (387860.)

9006. "Disturbance eliminator for use in connection with electric motors or other machines." Naamlooze Vennootschap Philips Gloeilampenfabrieken. March 28th, 1931. (387861.)

10724. "Means for ensuring safety in use of trackless electric road vehicles such as trolley buses supplied by overhead conductors." Soc. des Véhicules et Tracteurs Electriques (Vetra). June 11th, 1931. (387875.)

11457. "Electric motors." P. Groschopp, R. Oemig, and A. Oemig (trading as A. Oemig & Co., a firm). April 21st, 1932. (387879.)

12385. "Mirror carriers for use in television, phototelegraphic, telecinematographic, and like systems." W. W. Jacomb and Baird Television, Ltd. April 29th, 1932. (387881.)

17156. "Electric accumulators." Chloride Electrical Storage Co., Ltd. (E. W. Smith). June 17th, 1932. (387906.)

17415. "Electric drive for household sewing machines." Frankl & Kirchner Elektrizitäts Ges. June 20th, 1931. (387907.)

17672. "Arrangement of circuit for influencing the frequency characteristics of resistance-capacity coupled amplifiers." Siemens & Halske Akt.-Ges. June 22nd, 1931. (Patent of addition not granted.) (387912.)

18165. "Television systems." Radio Corporation of America. June 25th, 1931. (387915.)

19356. "Voltage regulation of alternators." English Electric Co., Ltd., and O. Ellefsen. July 8th, 1932. (387921.)

21651. "Turntable electric motors." J. B. Craig. August 27th, 1931. (387935.)

22335. "Apparatus for the compensation of the temperature error of Ferraris measuring apparatus." Landis & Gyr Akt.-Ges. August 14th, 1931. (387942.)

22574. "Electric discharge rectifying tubes." Standard Telephones & Cables, Ltd., and F. D. Goodchild. August 12th, 1932. (387944.)

23110. "Excess electric current switch." Stotz Kontakt Ges. August 17th, 1931. (387948.)

24940. "Sparking plug, particularly for aeroplane engines." Siemens & Halske Akt.-Ges. February 18th, 1932. (387954.)

25378. "Electric water heaters." British Thermostat Co., Ltd., and M. Payne. September 12th, 1932. (387957.)

25945. "Electro-therapeutic massaging appliance." W. H. Horsfield. September 17th, 1932. (387960.)

26106. "Method of and means for ventilating the stators of dynamo-electric machines." P. Ehrmann. May 19th, 1931. (Divided application on 14266/32.) (387961.)

26723. "Ignition coils." Ford Motor Co., Ltd. May 27th, 1932. (387964.)

27094. "High-tension batteries composed from torch batteries." G. Jäger. September 29th, 1932. (387965.)

28367. "Manufacture of electrical heating wires." Vereinigte Stahlwerke Akt.-Ges. October 15th, 1931. (387971.)

29159. "Electrical reproducers for disc records." C. Lindström Akt.-Ges. November 23rd, 1931. (387974.)

29555. "Magnetos." R. Bosch Akt.-Ges. January 28th, 1932. (387978.)

29861. "Luminous electric discharge tubes." General Electric Co., Ltd. December 17th, 1931. (387979.)

30363. "Portable electric grinding, drilling, and like machines." R. Bosch Akt.-Ges. January 25th, 1932. (Addition to 8303/32.) (387982.)

Trade Mark Applications

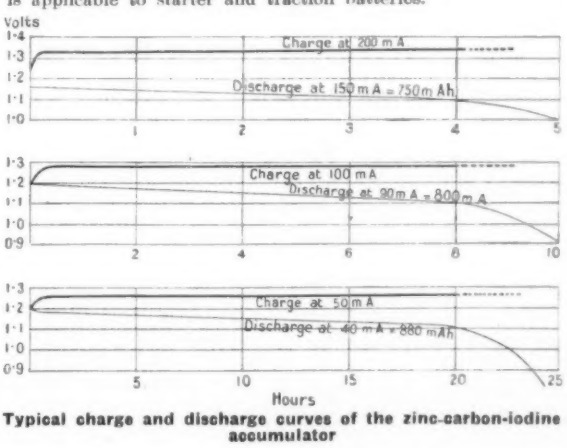
The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered with one month from March 1st:—

Reposalite. No. 538728. Class 15. Glass shades for electric lighting.—Charles Selz, 47-49, New Cavendish Street, W.1.

Lacrinite. No. 538523. Class 50. Insulating parts of electrical fittings and electrical insulating materials, being goods made from casein or of synthetic resin from condensation products of phenol and formaldehyde.—Lacrinoid, Ltd., 330-332, Romford Road, Forest Gate, E.7.

The Zinc-carbon-iodine Accumulator

THE zinc-carbon-iodine storage cell, attributed to a Chilean monk Francois Boisier, comprises a carbon positive and a zinc container (negative), the carbon plate being surrounded by activated carbon, and the zinc container being lined with cellulose. The electrolyte is a 60-deg. Baumé solution of zinc iodide, and the equilibrium reaction is $ZnI_2 \rightleftharpoons Zn+I_2$. The cell is charged at 1.3 V, the zinc liberated being deposited on the container while the iodine is adsorbed by the activated carbon. It is claimed that the electrodes undergo no chemical change, and suffer no deterioration analogous to sulphation. The accumulator is supplied commercially by the Cie. Française des Accumulateurs "Iodac," and experience shows that thousands of cycles of charge and discharge result in no liberation of gas, the electrolysis of zinc iodide occurring at 1.29 V, which is insufficient to decompose water. The cell can therefore be sealed hermetically with pitch, and in this respect offers all the advantages of a dry battery. No disintegration of the plates has been found to occur, whatever the rates of charging and discharging. Typical charge and discharge curves are reproduced herewith from *Le Génie Civil*; the voltage available on discharge commences at 1.2 V and falls gradually to 1.1 V. It is claimed that the new construction overcomes the difficulty experienced by earlier investigators as regards high internal resistance. The accompanying curves clearly relate to a storage cell of low capacity, such as might be used for wireless purposes, but it is claimed that the same construction is applicable to starter and traction batteries.


Volts
Charge at 200 m A
Discharge at 150 m A = 750 m Ah
Charge at 100 m A
Discharge at 90 m A = 800 m A
Charge at 50 m A
Discharge at 40 m A = 880 m Ah
Hours

Typical charge and discharge curves of the zinc-carbon-iodine accumulator

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Baginton (Warwickshire).—School for C.O.E. Managers; A. S. Webster, chairman.

Barking.—Houses (28), Westminster Gardens; Suburban Developments (London), Ltd. Factory, Alfred's Way; S. C. Lomas, Ltd.

Bathgate (West Lothian).—Swimming bath (£10,000); burgh surveyor, Municipal Chambers, 32, Hopetown Street.

Berry Wood (Northants).—Extensions, mental colony (£45,000); county architect.

Blackpool.—Houses (20), Rookwood Avenue; R. & H. Fletcher. Houses (20), St. Martin's Road; H. D. Whiteside. Hotel and cinema, Promenade and Dickson Road; Harvey Consolidated Estates, Ltd. Salerooms and shops, St. Anne's Road; Longstaff & Crossley. Town Hall extension; Special Committee.

Blaydon-on-Tyne.—Houses (84), various sites; T. Mastaglio, U.D.C. surveyor, Council Offices.

Bolton.—Houses (44), Breightmet Drive; Francis Draper. Houses (80), Lever Edge Lane; Palatine Builders & Estates, Ltd. Houses (80), Newport Road; Earl of Bradford. Estate development, Dean Road, Smithills; N. V. Ainsworth. Junior school, St. Ethelberts, for E.C. Extensions to works of W. Walker & Sons (electrical installations); Bradshaw, Gass & Hope, architects, 19, Silverwell Street.

Boston.—Factory, Norfolk Street, for United Canners, Ltd.; J. B. Dring, director.

Bournemouth.—Flats, with electrical work; Modern Service Flats, Ltd. Church, Southbourne (£7,000); F. A. Grigg, builder, Portman Road.

Bridlington.—Houses (122); borough surveyor. Houses (20), Marton Road, for J. Conlin; Johnson & Cook, architects.

Buglawton (Cheshire).—Houses (24); Kearton & Jones, builders, Congleton.

Carlisle.—Branch premises for Montague Burton, Ltd.; J. Lang & Sons, builders, Dalston Road.

Cheltenham.—Houses (26), Little Herberts' Lane, Charlton King's; T. L. Richardson. Houses (35), Hatherley Road; Wheeler & Mansell, Ltd. Telephone exchange, Prestbury Road; Office of Works.

Chester-le-Street.—Premises for M. Jackson & Son (Clothiers), Ltd.; T. Irwin & Sons, builders, Strawberry Lane Works, Newcastle.

Colne (Lancs).—Extensions, Hartley Hospital, Keighley Road; Holgate & Spivey, architects, 4, Dockray Street.

Dartford.—Houses (26), Ingram Road and Highfield Road; W. G. Cooper.

Dumbarton.—Buildings, Vale of Leven Academy (£9,000); master of works, C.C.

Dundee.—New St. Martin's Episcopal School (£10,000), and reconstruction of Butterburn School (£6,000); city architect.

Eastbourne.—Hotel, Mountfield Road and Lottbridge Drive; six shops, Upperton Road; and flats and garages, Seaside; P. D. Stonham & Son, architects. Alterations to York House Hotel, Royal Parade; A. Ford, architect.

Edinburgh.—Additions to factory for W. & M. Duncan, Ltd.; J. Inch Morrison, architect, 24, Duke Street.

Enfield.—Block of flats and shops, Church Street; L. A. Bowden. Boiler house, Artofex Works, Gt. Cambridge Road; Nissen Buildings, Ltd. Three clinics; U.D.C. surveyor. Factory extensions, Acme Showcard Co., Green Street; W. M. Brand. Two factories, Queen's Way, Ponders End; Churchbury Investment Co., Ltd. Restaurant and dance hall, The Ridgway; W. Jones & A. Teal. School, Brick Lane (£27,693); Pitchers, Ltd. Additions, Cosmos Lamp Works, Millmarsh Lane; A. J. Maxfield. Extensions, Sangamo Works, Gt. Cambridge Road; Wimperis, Simpson & Guthie.

Exeter.—Methodist church, St. Thomas district; trustees.

Falkirk.—Houses (£5,500); D. J. Callendar, architect, Royal Bank Buildings.

Gillingham.—Houses (136), Hillyfields Estate (£35,990); Kenn and Sons, Ltd., Bexley. Houses (500), Watling Street; G. H. Ward.

Glasgow.—Houses, Hill House and Baleragybank (52), and Teucharhill (324); housing director. Houses, Shawlands, Knightswood, &c.; architect, Housing Department. Church, Edinburgh Road, Muirend; Rev. W. H. Harrowes. Nine shops, Cardonald; A. Gilfillan, architect, Saltcoats.

Hyde (Cheshire).—Houses (258), Newton; borough engineer, Town Hall.

Ilford.—Houses (60), Dawlish Drive and Goodmayes Lane; Stoneley & Co. Houses (36), Longwood Gardens; A. Smith. Factory extension, Bogies Alley; Ilford Electrical Co. School, Mayesbrook (£34,975); Miller & Co.

Kendal (Westmorland).—Factory for Wm. Goodacre & Sons, Highgate; M. G. Shaw, architect, 45, Highgate.

Kidderminster.—Alterations and additions, Stour Vale Ironworks; Baldwins, Ltd.

Kingston-on-Thames.—Houses (500), and Municipal Offices and Courthouse (£150,000); borough surveyor.

Leeds.—Houses, Southfield Estate (£3,836), and 200 at Torre Estate (£52,370); W. B. Cooper & Sons, Ltd. Conversion of premises, Woodhouse Lane, for the College of Commerce; Architects' Section, Education Dept., Calverley Street.

Liverpool.—School, Pilch Lane, for Rev. J. McKenna, The Presbytery; L. Prichard, architect, 34, Moorfields.

London.—(Camberwell).—Extensions, Town Hall (£10,000); borough engineer. (Finchley).—Eighteen flats, Lyttelton Road; G. C. Swanson. (Lewisham).—Houses (43), Butterfield Street; New Ideal Homesteads, Ltd. (Poplar).—Tenements, Bakers Alley (£24,600); L.C.C. architect. (Southgate).—Houses (193), Bunce's Farm Estate, Firs Lane; H. Seymour Couchman and Son. Houses (62), Oakfield Road; C. E. Hartshorne. Houses (55), Wentworth Gardens; J. Neilson. Estate development next to London Electric Railway Station; Swannell and Sly. Post office, High Street; H.M. Office of Works. Extensions, Chequer Works, North Circular Road; S. N. Cooke. Extensions, Green Lanes; London Co-operative Society, Ltd. (Winchmore Hill).—Eight shops and flats, Hill Road; C. W. Dennis.

Luton.—Houses (70), Limbury Road; Seaward Bros., builders, Milton Road, Limbury.

Montrose.—Concert hall (£2,000); G. Fairweather, architect.

Northampton.—Houses (43), Grenville Avenue; Chowns, Ltd. Factory and offices, Grafton Street; J. Leighton, Ltd.

North Riding.—Senior school, Whitby; J. R. White, county architect, County Hall, Northallerton.

Norwich.—Fire station, &c. (£33,372); W. J. Simms, Sons & Cooke, Ltd., builders, Weekday Cross, Nottingham.

Plymouth.—Development of Crowndale Estate; W. Dalton. Development of Tow Meadow Estate; Serpell Trustees.

Prestwich (Ayrshire).—Burgh chambers, municipal offices and public baths; Wm. Shaw, town clerk.

Radlett (Herts).—Post office; H.M. Office of Works, King Charles Street, S.W.1.

Reading.—Telephone exchange, Tilehurst; H.M. Office of Works, King Charles Street, S.W.1.

Scarborough.—Extension, library, Vernon Road (£12,800); architect, Town Council.

Seaham Harbour.—Re-housing, Deanside; U.D.C. surveyor.

Sheffield.—Houses (51), Maple Grove; Miss I. M. Halliwell. Houses (694), Wybourn Estate; city architect. Engineering work, City Hospital (£3,045); Davy Bros., Ltd.

Smethwick.—Extensions, Brasshouse Lane and Crocketts Lane schools (£11,000) for E.C.

Shipley.—Houses (60), Crag End; U.D.C. surveyor.

Shipston-on-Stour.—Houses, London Road (electrical work); Banbury Estates Co.

Sittingbourne.—Houses (120), Bobbing Road (electrical work); G. Lewis & Sons, Ltd., builders, Dover.

Slough.—Factories, Oxford Avenue and Buckingham Avenue, for Slough Estates, Ltd. Works extensions, Argyle Avenue; International Gramophone Records, Ltd.

Southport.—Houses (158), Crossens Estate; G. H. Ball.

South Shields.—Branch premises, King Street and the Market Place, for M. Jackson & Sons (Clothiers), Ltd.; Glass, Harrison & Ash, 20, Saville Row, Newcastle.

Stirling.—Houses (52); A. H. Goudie, burgh engineer.

Sunderland.—Reconstruction of White's Market; J. Huntley & Sons, builders.

Sutton Coldfield.—Showrooms, Birmingham Road; Fleming & Sons.

Tralee.—Houses (125), Cloonmore; O. G. Trough, surveyor.

Wallsend.—Houses, Bigges Main and Archer Street; J. A. Blench, borough engineer, Town Hall.

Walsall.—Hotel, &c., George Hotel site (£48,000); J. Taylor, architect. Methodist Church, Aldridge (£6,000), for Walsall Central Mission; secretary.

Warrington.—Houses (34); J. Berry, R.D.C. surveyor, Church Street, Leigh, Lancs.

Wellingborough.—Factory, Hardwick Road, for Wellingborough Glove Co., Ltd. (electrical installations); Adams & Co., builders, Finedon Road.

West Riding.—Junior and infants' school, Thurnscoe; education officer, County Hall, Wakefield.

Whetstone.—Houses (22), St. Margaret's Avenue; C. V. McManus & Co.

Wisbech.—Canning factory, Norwich Road, for United Canners, Ltd., Boston and Louth.

Worthing.—Public baths (£52,447); borough surveyor. School (£9,000); education architect.

York.—Houses (20), Burnholme Estate; J. N. Dunn. Development of Mount Vale and White House Estates; R. J. Pulleyn & Sons. Library extensions; Town Council.

Bayonet Lamp-caps and Holders

THE first British Standard Specification for bayonet lamp-caps and holders, issued in 1910, laid down standard dimensions for the holder in such detail that the design of almost every component part was rigidly standardised. Experience showed that this restriction in the design was a serious handicap to the industry, and the Specification was, to a large extent, ignored as regards many of its details. Consequently when the Specification was revised in 1927 the only dimensions standardised were those essential to secure interchangeability and adequate mechanical strength. The Specification has again been revised, and it now covers the small size of cap and holder as well as the "ordinary size" articles, and also includes full details of suitable gauges for rapidly checking the caps and holders for compliance with the Specification. Some important changes have been made to the details of the "ordinary size" holder, in that a slightly lighter gauge of metal may now be used for the non-screwed portion of the barrel (thus removing the complaint that B.S. holders were unduly heavy and expensive). A new feature is the introduction of minimum mechanical and electrical clearances. The dimensions of lampholder plugs (adaptors) are also dealt with for the first time.

Copies of the Specification (No. 52-1933) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d., post free.